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The Institute of British Foundrymen
The Institute of Vitreous Enamellers
The National Ironfounding Employers' Federation
The Welsh Engineers' and Founders' Association
and
The Foundry Trades' Equipment and Supplies Association

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Wear and Tear

The unsatisfactory position now existing in reference to tax relief and the wear and tear of plant and machinery and the allied question of obsolescence is such that it is handicapping manufacturers in their efforts to keep up to date. Wear and tear are represented as being the reduction in value of a machine through use, which definitely excludes any physical deterioration through rusting and lying idle. Obsolescence is related to utility, as a comparatively new machine may have been superseded by a new invention or a more efficient model or be rendered inactive through changes in the market conditions, fashion, and a multitude of other factors. Thus the question of "age" is a very varying relative factor.

For the foundry owner the question is how wear and tear on plant and machinery are to be treated from the income tax point of view. If the cost be debited to capital account, then there is no tax relief. If it be charged against income, then income tax will be charged on reduced profits. Thus serious expenditure on modernising plant may render a taxable profit into a non-taxable loss. Actually, Somerset House has invented a third solution, which is that wear and tear of retained plant and machinery shall be, not indeed debited to profits, but treated as a tax allowance from profits, after these latter have been ascertained. This is somewhat like other allowances, but with this difference, that it makes on paper an actual reduction of total income. Within this clause, then, foundry owners may include renewals and replacement of parts on heavier machinery so long as the original machine has not quite completely lost its identity in a commercial sense. The smaller tools and repairs may also be included. The first cost of new plant and machinery, however, must be debited to capital expenditure.

There are complaints that the wear and tear tax allowances are insufficient, and that obsolescence relief is regarded somewhat unfavourably. There are, moreover, complaints that the allowances for wear and tear relief are not uniform, and certain districts are favoured or handicapped as a result. There is widespread objection to the basis on which the empirical allowances are calculated, which usually relate to last year's "written-down" value and not to the original cost. Thus whilst an endeavour may be made to write off the value of a £100 machine in 10 years, the authorities will still have it that according to their way of calculation it is still worth about £35 at the end of that period, and the relief will be £3 10s. instead of a ten-pound note. In some cases, however, the relief is yearly accorded on the original and not the "written-down" value. To our mind, every encouragement should be given to install new plant, for then both the Government and employer will be the better off.

Trade Prospects

The figures published in our issue for the last day of January suggested that the trade improvement which began in 1933 continued throughout 1934, and the unemployed dropped in 1934 to 16.6 per thousand compared with 19.8 for 1933. Apart from a setback in August, the general engineering, iron and steel and shipbuilding industries showed an almost continuous reduction in unemployment. The output of pig-iron was virtually half a million tons per month, as compared with a third of a million for 1933. A similar expansion in the production of steel ingots and castings took place, and the unemployment figures for the engineering industries tell a similar story.

Broadly speaking, the steel output approached, for 1934, nine million tons, an increase of nearly a third over 1933, itself having given an increase of a third over the previous year. The figure of nearly six million tons for pig-iron is over a third in excess of 1933, which again was a sixth above the previous year. The statistics of ironfounding do not permit such detailed figures, but these industries are so interdependent, and move so sympathetically, that somewhat similar figures apply. What this means to foundries as a whole, to equipment makers and material suppliers can only be surmised, but from our personal contacts we know that the result is immense, especially in creating confidence and offering hope where hope had almost died. The best post-war year in the trade was 1929, and these figures come within reach of that year, which had 9.6 million tons of steel and 7.6 million tons of pig-iron. It is perhaps not surprising that imports should increase, but the jump of 40 per cent. in iron and steel imports over 1933 is alarming, taken in conjunction with the formidable proportion of unemployed still not absorbed, amounting to a fourth of those registered.

The latest figures for shipbuilding, for 1934, show remarkable increases. The British output was 48 per cent. of the world total, compared with 27 per cent. for the previous year, and that

(*Concluded on page* 120.)

XUM

Correspondence

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

Water in Sand

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—Foundrymen are aware that when they buy moulding sand they also buy water—*BUT HOW MUCH WATER?*

It would be interesting to know how many foundries in ordering moulding sand, specify an allowed water content and adjust the price according to whether the water content is above or below this allowed amount.

It is obvious that moulding sand must vary in the amount of water which it contains, and in some cases, according to the weather prevailing at the time it is quarried and loaded, this must be very considerable. Does the foundryman responsible for accepting delivery know or bother as to how much this variation is, and how much it costs him?

Suppose, as an example, that 100 tons of sand be ordered, where the normal water content is assumed or agreed upon at a figure of 7 per cent. Suppose, further, that the sand when received at the foundry contains 15 per cent. water. If the sand is in wagons covered with tarpaulins the moisture must have been in the sand before despatch, and therefore the weight as received will be only the 100 tons as ordered; but note, *NOT* 100 *TONS OF SAND*. Actually, of course, there will be only 85 tons of sand. Having allowed 7 per cent. of water, however, there should be 93 tons of sand—so instead of 93 tons of sand only 85 tons is received—a loss of 8 tons, or in cash value, assuming a price of 15s. per ton, a loss of £6.

It may be that where no laboratory facilities exist the foundryman may think that checking such a vital point is beyond him, and may adopt the philosophical attitude that as he is unable to determine the water content, he must perforce endure what is obviously a very unsatisfactory state of affairs. Thereupon, when his next batch of sand is delivered in a very wet condition, he does his little grumble and there the matter ends. But I would suggest that laboratory facilities are not at all essential to check this point. Sufficiently accurate water determinations can be made with the ordinary appliances which are found in every foundry. All that is necessary is to take a good galvanised bucket, fill with the sand to be tested; weigh on a reasonably accurate scale; place in the drying stove for 24 hrs.; then re-weigh. The bucket should be replaced in the stove for a further period and again weighed. If, or when, a constant weight is obtained, the difference or loss represents water, and a simple calculation gives the percentage.

The systematic checking of deliveries of sand in this way would provide interesting data. It would be very interesting, too, to have the views of other readers on this matter.—Yours, etc.,

A. LOGAN.

Newcastle-upon-Tyne.
February 8, 1935.

Metallurgical Values

To the Editor of the FOUNDRY TRADE JOURNAL.

SIR,—In the consideration of the Sub-committee's Report on Foundry Costing, some discussion has arisen on the above, which to me appears exaggerated.

For purposes of metallurgical values due to loss in melting, only Si and Mn need be considered, and assuming these elements start with 2.5 per cent. and 0.8 per cent. respectively, according to one authority, the losses in melting are Si 0.25 per cent. and Mn 0.10 per cent. (Fe agreed approx. 5 per cent.).

I very much doubt whether it would be contended that, *on every subsequent re-melt*, even

(*Concluded in next column.*)

District Presidents

No. 15

WEST RIDING OF YORKSHIRE BRANCH OF THE INSTITUTE OF BRITISH FOUNDRYMEN

Mr. A. W. Walker, the President of the West Riding of Yorkshire Branch of the Institute of British Foundrymen, was educated at the Royal Technical College, Glasgow. After serving an apprenticeship with Messrs. G. & J. Weir, Limited, Cathcart, Glasgow, he became foundry foreman with Messrs. E. Green & Son, Limited, Wakefield. He was then for a time outside representative with Messrs. Kelly Bros., Wrexham, until he was appointed chief of Messrs. Aveling & Porter's foundries at Rochester. He

MR. A. W. WALKER.

left Rochester for Messrs. Harrison & Camm, Limited, Rotherham, where he was foundry manager until he was appointed to his present position of foundry manager with Messrs. T. Broadbent & Sons, Limited, Huddersfield. Mr. Walker joined the London Branch of the Institute of British Foundrymen in 1921.

(*Concluded from previous column.*)

to destruction, these elements lose in the same ratio; therefore, I am at a loss to understand the significance of increased metallurgical values on this account.

I quite definitely think the Sub-committee are wrong in their conclusions for arriving at cost-of-metal-at-the-spout, by including such foundry contingencies as "wasters," "blowers," "bad coring," etc., due to something entirely different from the melting process.

Certainly these should be, *and are*, allowed for by any foundry executive in calculating costs, but it cannot be too strongly emphasised that in making up costs for quotation purposes, it is better to take the nearest round figure, *i.e.*, 5 per cent., as actual "melting loss," and cover other causes as an average on good castings produced, in the final reckoning.

I have not taken out practical tests to prove figures of loss on continued re-melting, and would welcome authoritative information on the subject.—Yours, etc.,

G. MORAN.

Reliance Foundry Company,
Birmingham Street,
King's Hill, Wednesbury.
February 12, 1935.

Enamellers' Activities

Silicosis

The two Papers on "Silicosis," to be given by Dr. E. L. Middleton and Dr. W. R. Jones to The Institute of Vitreous Enamellers in London on February 29, are an extremely important matter to the whole of the industry, as some feel that these regulations are definitely unfair to the enamelling industry, because of the small proportion of men who come into contact with free silica, during the mixing of enamels work in an atmosphere which is only slightly contaminated with silica, and only this for about one-tenth of their working time.

New Members

At the last meeting of the Council of The Institute of Vitreous Enamellers the following were elected to the various grades of membership:—

As Subscribing Firms.

Cronite Foundry Company, Limited, Lawrence Road, Tottenham, London, N. (Representatives: Mr. S. W. G. Snook and Mr. A. L. Fawkes); Darwins, Limited, Fitzwilliam Works, Sheffield (Representatives: Mr. J. W. Griffiths and Mr. J. G. Holmes); the Rapid Magnetting Machine Company, Limited, Magnet Works, Lombard Street, Birmingham (Representative: Mr. M. Dudley Thompson); H. F. Spencer & Company, Limited, Mitre Works, Eagle Street, Wolverhampton (Representative: Mr. Henry Francis Spencer).

As Ordinary Members.

John Cooper Owen, c/o Bank of New South Wales, Sydney, Australia (of Metters, Limited); Andrew Gardner (Metters, Limited), Melbourne, Australia; Th. Teisen, C.E., 20a, Temple Street, Birmingham; Daniel Dixon, c/o the Morgan Crucible Company, Limited, Church Road, Battersea, London, S.W.11.

As Associate Members.

William Lawrence (of Messrs. S. Flavell & Company, Limited, Leamington), 55, Greville Road, Emscote, Warwick; J. M. Price (of Credenda Company), Westbourne, Victoria Road, Oldbury.

As Associate.

Frederick John Child (sales engineer, Broom & Wade, Limited), 143, Nimrod Road, Streatham Park, London, S.W.16.

Import Duties Advisory Committee

It was reported at the recent Council Meeting that, as a result of representation on behalf of The Institute of Vitreous Enamellers and other bodies, to the above, the duty on the importation of enamelled ware into this country had been increased from 10 to 25 per cent.

The Institute is still interested in this matter, and it is proposed that should this amount be found insufficient an endeavour will be made to obtain a further increase.

Trade Prospects

(*Concluded from page* 119.)

world total itself was nearly double the previous year. As a vital British industry, these figures are very encouraging.

Altogether, we think the rather alarmist views expressed a few months ago of the approaching saturation of the home market and consequent decline of the present activity are not well founded, and progress is continuing on steady lines. If price increases of too pronounced a character can be kept in check the general situation will be kept well under control and expansion assured for some time to come.

The Practice of Melting Aluminium*

By A. von ZEERLEDER

In the control of metals laid down in the Ordnance of August 15, 1934, the use of copper and its alloys in foundry work was restricted for economic reasons. As a result of this, a large number of foundries which formerly used practically no aluminium, or only dealt with it quite occasionally, have gone over to an extended use of light-metal castings. It is so much the more necessary to draw attention to the special considerations which enter into the melting of aluminium. Since every manufacturing process, whether in the foundry or in the working-up industry, must presuppose a melting process, the latter assumes especially great importance. As a result of the necessity of utilising the scrap from the melting works themselves, not only the founders, but also the majority of others engaged in the working-up industry are obliged to maintain their own melting plant in which the sheet and pressings scrap is remelted with addition of virgin metal and cast to new rolling slabs and extrusion billets.

While the aluminium rolling and extrusion works have gone a long way to specialise and operate their own designs of aluminium melting plants with extremely good results, the foundries which have to work in aluminium castings, in addition to heavy metal castings, are frequently not in possession of special aluminium-melting plants, and the view is not infrequently expressed that aluminium can be satisfactorily melted in any brass- or bronze-melting plant with the same precautions as are employed in respect of these metals and in the hope that equally good results will be obtained. The high percentage of defective castings which such foundries suffer is attributable by more than 50 per cent. to inexpert melting technique.

Ready Oxidisability of Aluminium

First and foremost in this connection the low melting point of aluminium and its capacity to absorb gases on overheating and to reduce oxides, combined with its ready oxidisability, must be taken into consideration. As the temperature increases, and more particularly above 800 deg. C., the absorbability of molten aluminium for gases increases very rapidly, and as a result of this, coupled with the high diffusion velocity of hydrogen, considerable quantities of the latter element are taken up.

Such gas is only re-liberated on solidification, and the metal then exhibits a distributed network of gas pores. The capacity of aluminium for reducing oxides, such as silicic acid or iron oxide, is therefore especially dangerous, since it leads to aluminothermic reduction accompanied by formation of corund. The corund formed by reduction of the oxides is solid at the ordinary melting temperature for aluminium, and forms excessively hard inclusions in the casting, which interfere badly with the cutting of the casting. The ready oxidisability of aluminium has not only to be taken into account, because of the unavoidable losses by burning, but also because of the fact that the amorphous oxide formed is possessed of practically the same specific weight as the liquid metal, and as a consequence remains partially suspended in the melt. The inclusions not only prejudice the tensile strength of the casting, but also react unfavourably on the viscosity of the molten metal, so that its mould-filling properties are impaired.

Both crucible and hearth furnaces are suitable for the melting of aluminium. In the case of crucible furnaces, the first question which arises is that of the material which can be employed. According to the requirements of the melt or casting, a cast-iron or graphite crucible may be employed. Cast-iron crucibles have the advantage of lower initial cost, better heat transference and longer life, but, on the other hand, there is always the risk that, as a result of the solution of iron in aluminium, a high-melting iron aluminide ($FeAl_3$, melting point 1,150 deg. C.) will be formed and crystallise in the form of hard needles when the melt solidifies. An effective protective layer can be formed by lining the crucible suitably with a solution of graphite lampblack, alumina and lime in diluted waterglass or molasses, introducing this composition into the crucible at a temperature of 70 to 90 deg. C., and subsequently heating it slowly; by this means there is no question of direct contact with the iron crucible and solution by the molten aluminium is prevented. A suitable composition is, for example, 40 per cent. aluminous material, 10 per cent. lampblack, 45 per cent. water and 5 per cent. waterglass. Since iron aluminide for the greater part collects at the bottom or remains as a crust on the walls, at the end of the melting period the crucible must be very carefully emptied and cleaned out and a new protective coating applied again. For the production of high-duty castings, more particularly of corrosion-resistant or heat-treatable alloys in which even the smallest additional iron impurity is deleterious, graphite crucibles are to be preferred, however.

Gas Absorption

In the flame or hearth furnace, likewise, the material of the melting compartment is of importance, but there is no need in this case to be so particular about it as is frequently suggested. A good 75 per cent. aluminous chamotte or sillimanite is a completely suitable construction material, and the use of pure alumina brick or magnesite brick is definitely not necessary. A much more important factor in the flame furnace is the correct arrangement of the flues, which should be such that the molten-metal surface is in no case licked with flames to give rise to local overheating. In addition, access of oxygen should be prevented by means of the gases of combustion. Working under raised pressure, as is frequently the practice in oil-fired furnaces, also gives rise to increased gas absorption. The oxide film which covers the metal presents an effective protection against the intake of gases, so long as this is not overheated or interfered with by flames on the surface. Reference will later be made to the use of fluxes.

The choice of fuel is a matter of considerable importance. Since molten aluminium has a special tendency to take up hydrogen, it is undesirable to employ fuels rich in hydrogen (illuminating gas and oil) in the flame furnace. The most suitable fuel is dry coke, which is used in a semi-gas firing. In the case of oil firing, also, a considerable gas absorption occurs, and the danger of overheating flames arises to a greater extent. If it is desired to provide absolute security, the use of a muffle is to be recommended; this separates the melting chamber from the gases of combustion—admittedly prejudicing the economic efficiency of the furnace compared with direct heating. Since, however, particularly on melting light scrap such as turnings, thin sheet, wire, etc., there is a very considerable diminution of loss by burning, the larger consumption of fuel may in some cases be more than outweighed by the economy on this score. Instead of heating by means of fuels, a muffle furnace may also be electrically heated. Since the metallic heat resistance is rapidly destroyed on contacting with the aluminium, this has to be separated from the walls of the melting chamber by means of a muffle or a lining to the walls.

The chief advantages of electric melting consist in the completely still atmosphere, which is also free from hydrogen and steam conditions which are far from being attainable in fuel-fired furnaces, even where muffles are used, since the muffles are always, to some extent, gas-porous. Accordingly, of recent years, even in localities where power costs are comparatively high, electric-melting furnaces have been installed where it is required to melt high-duty materials, more particularly heat-treatable and corrosion-resistant alloys. In general, it is the economic factors which decide what type of furnace is to be used. Electric furnaces are economical, particularly in the case of continuous working. Crucible furnaces of this type are very often used for keeping the metal in the direct neighbourhood of the casting apparatus hot, while the melting proceeds in a separate chamber in a hearth furnace. In electrically-heated crucible furnaces, where graphite-clay crucibles are used, the carbon is gradually consumed away, and the crucible therefore wears away, from the outside. It is accordingly desirable to employ a special-quality graphite crucible glazed on the outside, which permits of no oxidation, or, alternatively, to employ the crucible first in the coke fire, where an external glaze is soon produced by the coke ash.

Since above 800 deg. C. both gas absorption and oxidation are markedly increased, the material to be melted should never be heated above this temperature. To facilitate sufficiently rapid melting of the charge, however, a temperature of 900 to 1,000 deg. C. should be maintained in the melting chamber. If a charge is first melted and the metal then withdrawn from the furnace, there is always the danger that the last metal may be strongly overheated, since the firing cannot be completely controlled. Even if this were possible—as in the case of gas and oil burners—the brickwork, and particularly the roof, would have, in the majority of cases, considerably exceeded the melting temperature, and would give up its heat to the metal. Where continuous melting is operated, however, the furnace is completely in equilibrium, and by a control of the charging the operators have it completely within their power to vary the temperature of the molten metal. More particularly in electric furnaces, automatic temperature control is provided in the majority of cases, since this is desirable if for no other reason than for the life of the heating coils, which do not support overheating.

Effect of Steam in the Furnace

A factor which is much too little taken into consideration is the capacity of the molten aluminium to disintegrate steam into hydrogen and oxygen, as a result of which the oxygen burns with the aluminium to give alumina (Al_2O_3), while the hydrogen is greedily absorbed by the aluminium. The access of steam to the melting furnace is possible in the most diverse ways; for example, from the use of generators with steam supply or with water seals, or, in the case of coke furnaces, from the use of damp coke. For this reason, in the latter case, it is essential to use only thoroughly-dried coke. This should be stored under cover, and before actual use should be kept for one or two days near the fire in order that it may be thoroughly dried out. For the same reason, the metallic raw material and the scrap metal should always be kept in dry places.

If, on the other hand, turnings, which are frequently contaminated with lubricating oil or soapy water, are to be melted, special precautions must be taken. Before melting it is essential always to subject such turnings to a special degreasing treatment, and subsequently to dry them by heating at 200 to 300 deg. C. In a rotary drum, with the object, at the same time, of dispersing any organic impurities which may

* "Light Meta's Review," Vol. I, No. 15.

be present, such as stray threads from cleaning materials and any oily residues, for the latter materials can have an unfavourable effect in the sense of being impurities during the melting of the metal. With the object of reducing loss by burning, the turnings, after these treatments, are pressed together. The melting of turnings requires actually quite a special technique. Preferably after preheating, the turnings are directly immersed in a bath which is already molten and heated to 800 deg. C.

If only turnings are to be melted, a certain sump must always be left in the crucible or furnace hearth, so that the first turnings can be immersed in the molten metal. Even with these precautions, the amount of oxide which forms when turnings are melted is considerably increased, and therefore the use of fluxes to purify the bath and improve the yield are, in this case particularly indicated. Aluminium oxide, which forms the so-called scum, has the property of holding 50 per cent. and more of its weight of metallic aluminium unless fluxes are employed. Subsequent grinding and sieving admittedly make it possible to separate the oxide from this metal, and to reduce the loss by burning in practice. If it is not possible to observe the above-described degreasing and drying of damp scrap, care should be taken that such material is melted with very special precaution and cast to crude ingot. On solidification, metal of this type gives up its gases, and in the majority of cases is porous. When the metal is remelted, it is possible to disperse the greater part of the gases.

Pyrometric Control Essential

Likewise in the case of a newly-bricked furnace or a fresh graphite crucible, even after scrupulous drying and heating at red heat for many hours, steam is given up to the metal; so that in a new furnace a few charges of scrap should always be first melted and cast to ingot before the metal is used for direct-casting purposes. Only when a few test castings have shown that the metal gives a non-porous casting should the furnace be put into requisition for the standard production. Particularly in the use of scrap of unknown composition, an accurate examination is essential before proceeding with casting, for, to attain certain properties, it is absolutely necessary that the casting shall always have a definite composition.

Both for the melting process and for the subsequent pouring, exact temperature control is most essential. A rough appraisal relying on the eye is not permissible, if for no other reason than that the dense oxide film which covers the metal does not allow of observing the heat colours. Old hands use as a rough guide the test whereby a 15-mm. thick iron rod is immersed in the melt until it reaches the same temperature, which takes some 30 secs., and then by withdrawing the rod they can decide according to its heat colour what is the temperature of the melt. This method, however, involves the risk of iron impurity gaining access, and this must be taken into consideration.

With the temperatures which are used in practice, however, namely, 700 to 800 deg. C., the necessary accuracy of $\pm$ 20 deg. C., is not capable of attainment by judgment, even with the most experienced worker, for the influence of variations in the daylight due to sunlight or cloud is such as to prevent visual control. A suitable temperature-measuring apparatus with Nichrome or Chromel-Alumel thermo-element, with naked unprotected welds and a millivoltmetre with about 200 ohms internal resistance, costs about 200 Rm., and this figure is very soon repaid by the saving on rejects. Thermo-elements with metallic or ceramic tubes are little suitable, as there is a long lag before the correct temperature of the metal is indicated; while with naked welds and elements wires of 2 to 3 mm. thickness, the weld registers the temperature within 5 to 10 secs. If the element is not left in the melt longer than is necessary to take the reading, hundreds of measurements can be made with the same weld until this is gradually worn away by solution. The use of a thin protective coat may still longer preserve the life. A defective weld can readily be repaired by a skilled welder, and the element thereby made usable for a further period. Obviously, it is necessary to take care that the contacts on the measuring scale do not get heated if a compensation lead is not used in conjunction with the millivoltmeter, since only the temperature difference between the hot weld in the molten metal and the other end of the thermo-element or the compensation lead is registered.

If the raw material for melting consists exclusively of virgin aluminium, the loss by burning is so small that the use of fluxes is scarcely necessary. If, however, lighter material, such as ends of castings, sheet scrap, or even borings, is to be melted, the loss by burning increases in accordance with the dimension of the surface of the melting material, and it is desirable to use fluxes to improve the yield. It should be emphasised expressly that there is practically no flux which is capable of reducing the aluminium oxide formed to metallic aluminium again, but the flux diminishes oxidation and reduces the gas absorption of the metal because of the formation of a protective film intermediately between the molten metal and the gases of combustion. In addition to this, good aluminium fluxes have the property of dissolving the so-called slag or scum, whose melting point lies above 2,000 deg. C., and in consequence, as already mentioned, offer the possibility of re-uniting the metal particles contained in the scum with the molten metal. The chief property of a flux must therefore be a melting point of below 600 to 650 deg. C., so that it melts before the aluminium. In addition to this, a good solubility for aluminium oxide is essential, while, at the same time, it must not contain any constituents which would be absorbed by the molten aluminium to interfere with the quality of the alloy.

Dry Fluxes Suggested

Since many of the salts contained in fluxes are hygroscopic and absorb moisture from the air, the use of damp fluxes involves the risk which has been dealt with above, of the decomposition of the steam and consequent hydrogen absorption by the metal. For this reason, the fluxes must invariably be scrupulously dried and protected from the intake of atmospheric moisture by storage in properly-closing receptacles. Large foundries maintain a drying cupboard at a temperature of 200 to 300 deg. C., and make a practice of storing the flux in this for 12 to 24 hrs. before use. Such a method provides the best guarantee of the complete drying of the fluxes.

Quite as objectionable as the taking up of impurities by the melt from fluxes is also the taking up of impurities from the casting tools. Ferrous tools should not, therefore, be allowed to stay longer in the molten aluminium than is absolutely necessary. Before pouring, the metal should be most carefully skimmed in order to remove, as far as possible, any oxide skins present. For this purpose, either a perforated cast-iron ladle or, better still, a perforated graphite ladle, should be used, and this should be repeatedly drawn slowly through the melt from the bottom up, to bring any oxide skins to the surface. It is a frequent practice, also, after melting, to use so-called refining agents in the melt. The principal object of these is the removing of the suspended oxide skins and any dissolved gas contained in the melt. They frequently contain potassium chloride, sodium chloride, calcium carbonate and sodium fluoride or sodium silicofluoride, sodium chloride, potassium chloride and cryolite in varying amounts.

A Simple Machine for Coremaking

Founders have in recent years seen much of the drudgery of foundry work taken out of moulding operations by new and ingenious machinery. When the cost of finished castings is reduced concurrently with the improvement in working conditions, the ideal is close at hand.

One of the most monotonous operations in many foundries is coremaking. Whether a dozen or a thousand cores of one shape and size require to be made, the human coremaker frequently performs his work with a mechanicalism born almost of apathy. That is not good for him or the finished casting.

Many excellent attempts to change coremaking procedure have been noted in the past, and machines in which rotary motion and pneumatic pressure have been combined as a means of filling

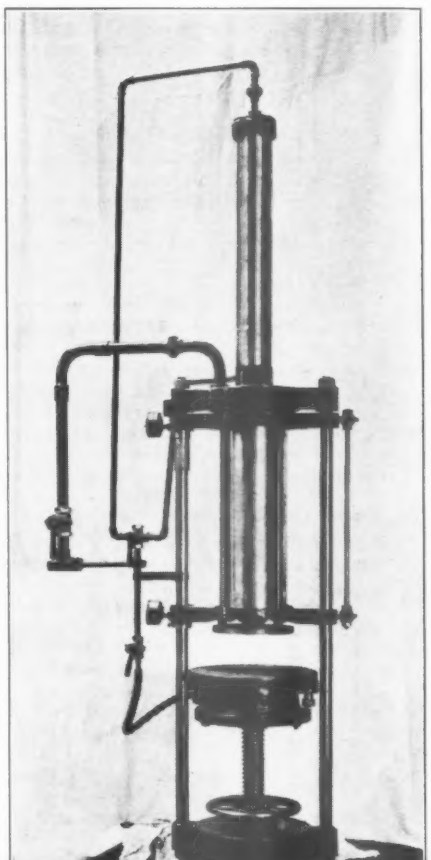


FIG. 1.—THE ROCKET COREBLOWING MACHINE WITH ADJUSTABLE TABLE.

coreboxes with sand have done much useful work. In this short article we give some details of the latest type of apparatus for coremaking.

The machine, shown in Fig. 1, consists of a sand reservoir supported on columns above a table on which the corebox is placed. Pressure is applied to the top of the sand, which is forced into the corebox through a special nozzle in the bottom of the sand reservoir. This method avoids air cavities and produces a uniform sand density, and therewith structure, throughout the core. The advances claimed over previous methods of mechanical coremaking consist in the absence of motor-driven agitators, or of extruders, which tend to form cavities in the sand and cause an erratic delivery of the sand into the coreboxes. It is also claimed that, along

(*Concluded on page* 132.)

Some Aspects of Plant Lay-Out and Production

By J. T. GRAY

(*Concluded from page* 111.)

Fig. 13 shows, through the courtesy of Messrs. Sidney Flavel & Company, Limited, a lay-out plan of an enamelling plant producing cast-iron stove parts. The object sought was to obtain straight-line production and a semi-continuous flow of work through the department. Conveyors of various types were considered, but ultimately rejected in favour of the system adopted.

Frit Milling Rooms

The positions of the various operations commencing with annealing, proceeding to sand-blasting, inspection, filling, spraying, drying and fusing have been well thought out.

Fig. 14 shows a general view of the mill room and it will be observed that the space available allows for considerable extensions. The large mills are chain-driven by individual motors and the smaller mills by belt from overhead shafting. The equipment includes a magnetic separator and a sifting machine. The wet enamel containers, each of which is mounted on a light, simple type of skid for easy conveyance, are worthy of mention.

In some modern mill rooms it is the practice to have a two-storey building with the frit stores and mixing carried out overhead, and the mills are charged through shutes in the floor to the mills below. This is quite good practice where mills of large capacities, say, 1,000 lbs. and over, are used, and where the mill room is large enough to necessitate the employment of three or more men.

FIG. 14.—FRIT MILLING ROOM.

In small and medium-sized mill rooms, however, milling, say, up to 25,000 lbs. of wet enamel per week, where one mill-room man or a man and boy are employed, there is ample time to charge the mills from ground level, and their whole time and attention are confined to one floor only.

Compressor House

The equipment of the compressor house comprises two compressors each having a capacity of 600 cub. ft. per min., each driven by 115-h.p. motor, and one 300 ft. per min. by 50-h.p. motor.

The drive is by vee-rope, which allows for short centres between the compressor and motor and a certain amount of elasticity. Only one 600-ft. and the 300-ft. compressor are in constant use, the other 600 ft. being a standby and to meet peak loads, when the second rotary table is required.

One 600-ft. and the 300-ft. compressor are sufficient to supply the four-nozzle rotary table, the cabinet, sixteen spray booths, two dusting pistols, and four spray booths in an adjacent shop for synthetic work.

Annealing Department

Fig. 15 shows an annealing furnace. This furnace is of the semi-muffle type, and is fired by means of fuel oil. In this type of furnace the products of combustion are discharged into the working chamber through a series of ports along each side of the working hearth, as it is not necessary for annealing to have a completely enclosed muffle, and as no carborundum or similar expensive muffle is necessary, this type of furnace is cheaper in first cost and more economical to run.

The furnace has a clear internal working space, 10 ft. from back to front, 5 ft. wide, and 2 ft. 9 in. high above the landing walls. This height is necessary to accommodate the hanging perrets, of which there are four per load and 20 framed castings per perret, giving a total of 80 of this type of casting per annealing load. The same type of perret is used in the fusing furnace, but, of course, the number of castings is reduced by about half.

A double-acting charging machine is used, and one man operating this furnace handles 5¾ tons of light stove castings per day of 8½ hrs. The annealing furnace was placed at what was decided an economical distance from the sand-blast, and on what might be termed the commencement of the productive line.

Sand-blast Department

Fig. 16 shows a general view of the sand-blast department, and the annealing furnace, shown in Fig. 15, is distinguishable on the right-hand side. Two rotary tables and a small cabinet comprise the sand-blast equipment. Only one rotary table is in constant use, the second having been installed as a standby and to meet peak demands. Three men per shift are employed in this department, one on the rotary table, one on the cabinet, and the third man assists the other two by feeding them with work and generally processing the castings through the sand-blast department. A fourth man is called in when the second rotary table is required. When the plant is working on three shifts, the fourth man acts as a charge hand, spending a certain amount of time looking after each shift.

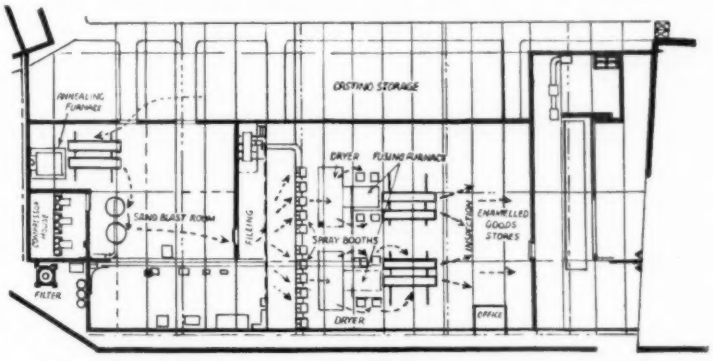


FIG. 13.—LAY-OUT OF AN ENAMELLING SHOP FOR IRON CASTINGS.

The output from the rotary table is 6 cwts. of light general stove castings per hour. That is per man-hour, because there is only one man on the table. The machine is fitted with four ⅜-in. dia. nozzles, and No. 16 steel grit is used as an abrasive. When this plant was installed, the cabinet was used for blasting the edges of the castings, but it was soon found to be redundant, as the edges were sufficiently cleaned for enamelling by the rotary tables. The cabinet is now used for de-enamelling and special jobs.

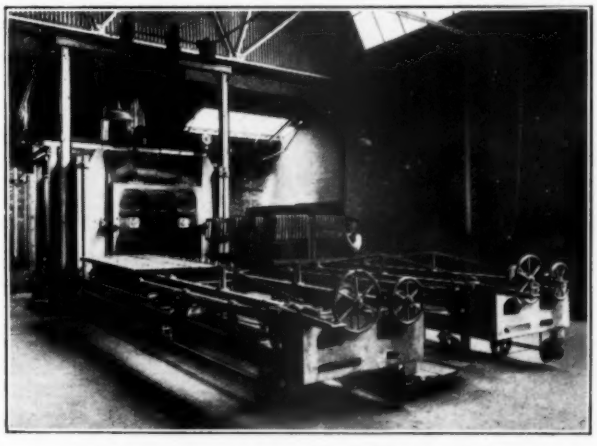


FIG. 15.—ANNEALING FURNACES FOR IRON CASTINGS.

Work Handling

The method of conveying the work to and from the various operators is by the usual jack-lifting truck, skids and trays, but the system is so

arranged that the skids and trays continually circulate backwards and forwards between two stations only. For instance, the castings from the annealing furnace are loaded on to skids and conveyed to the sand-blast, where they are lifted from the skids and placed on the rotary table, where, for maximum efficiency, it is necessary to "mix" the castings, as, if the rotary table were loaded with framed castings only, these would leave too much of the surface of the table exposed to the action of the abrasive material.

FIG. 16.—GENERAL VIEW OF THE SAND-BLAST SHOP.

As castings are lifted from the rotary table they are placed on fresh skids and separated into their various classes. The skids unloaded at the sandblast are returned by the third man to the annealing furnace. Therefore these skids travel only to and from the annealing furnace and the sandblast, and this method of skid circulation is adopted throughout the plant. As the skids of work are loaded in the sand-blast department, they are conveyed to the inspection and filling bench by jack-lifting trucks.

Sand-blast Maintenance

An average sand-blast maintenance cost has been arrived at, calculated on information obtained from a number of works where reliable information was available. In every instance rotary-table machines are used, and as a basis of calculation the maintenance cost per 100 cub. ft. of air per min. compressed to 60 lbs. per sq. in. has been taken, and the average figure works out at 19s. 10d. per week. In other words, for a sand-blast plant using 800 cub. ft. of compressed air per min., the maintenance cost on this calculation would be £7 18s. 8d. per week. This figure covers for all labour and materials used on maintenance of motors, compressors, sand-blast apparatus and rotary tables.

Inspection and Filling Department

The inspection and filling bench is situated on the line of progress through the department. Here the castings are blown clear of dust, inspected, and filled. Three youths handle this operation. As these skids are emptied they are returned to the sand-blast department. After filling, the castings are loaded on to fresh skids and are conveyed to the spray booths.

Spray Booths

Fig. 17 shows the spray booths. The skids of work are distributed along the back of the booths and there is just sufficient space—2 ft. 6 in. between the booths—to allow for a skid of work. Therefore each sprayer is supplied with work without any traffic passing in front of the booth, which would interfere with the production. The clear space—5 ft. 6 in.—in front of the booths is noteworthy. Each sprayer takes her work from the left-hand side of her booth. It will be observed that overhead gravity-feed enamel containers are used. The booths are 3 ft. 6 in. square and some are double booths, that is, fitted with a central partition which can be withdrawn, widening the booth to 7 ft., to accommodate large work.

Each booth is supplied with a bulkhead electric light which is fitted just in front of the centre of the turntable, giving a practically shadowless light. The baffling arrangement comprises a frame of loose corrugated louvres, and tests have proved that these louvres arrest the maximum of enamel dust consistent with low resistance to the air flow. At the mouth of the booth the air velocity is 90 ft. per min., which is 30 ft. per min. higher than the minimum allowed by the authorities. The exhaust from spray booths is an important matter, as excessive non-baffled drafts will carry a considerable amount of comparatively expensive enamel to waste.

The following figures are probably the first reliable tests ever carried out to determine the efficiency of vitreous-enamelling spray-booth baffle and exhaust apparatus.

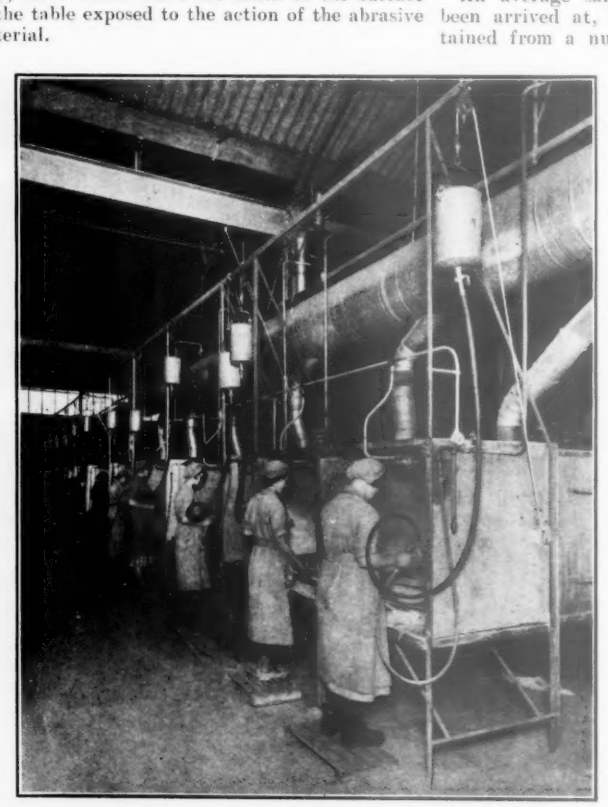


FIG. 17.—SPRAYING BOOTHS FOR CAST-IRON WARE.

FIG. 18.—DRYING PLANT.

The main culvert is connected to a textile bag filter having thirty bags each 10 ft. long and 12-in. dia. to ensure the figures being of value, this installation had been in operation for over

twelve months prior to the tests being made, and only the collecting box at the bottom of the textile filter was emptied and thoroughly cleaned so that all recesses in the exhaust system were

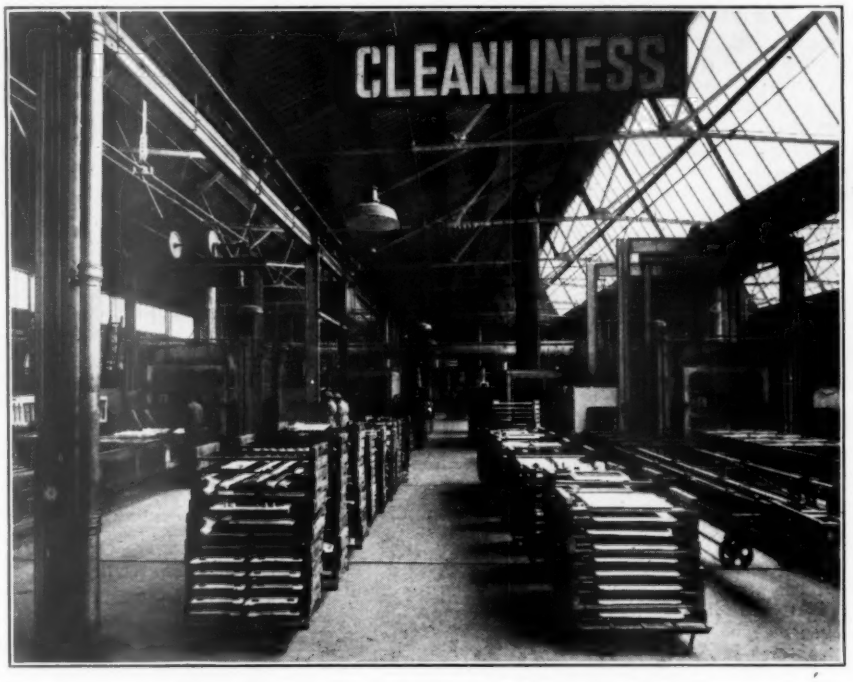


FIG. 19.—GENERAL VIEW OF THE ENAMELLING SHOP.

filled. It is rather important, when making such tests, that one should not have the old exhaust system cleaned right out; otherwise a quantity of the dust will find its way into crevices in the system, and a false reading will be obtained.

During the test, all enamel was carefully weighed prior to being distributed to the sprayers, and all enamel returned was weighed and deducted from the first figure. That is, enamel not used, of course. During the period of the test, 11,823 lbs. (wet weight) of enamel were sprayed. This is equivalent to 7,567 lbs. dry weight. The ordinary practice of cleaning out the booths at the end of each shift was continued, and at the end of the test the collecting box was again removed and the contents carefully weighed. This weight was found to be 173 lbs. Therefore, only 1.463 per cent. of the enamel (wet weight) was drawn into the exhaust.

This low percentage of material passed through the exhaust system definitely proves that the system of baffling consistent with having an adequate draft at the mouth of the booth, is extremely important. During the test the usual run of stove castings were processed, a considerable percentage being framed or skeleton castings, and small parts. A considerable amount of enamel sprayed necessarily misses the job, and it is important that this material should be recovered and re-used—not discharged through the exhaust to waste, as is the case in a considerable number of enamelling plants.

In these works approximately 80 per cent. of the work is mottle, and approximately 20 per cent. self-colour. In the case of the mottled work, the base colour is sprayed and dried, and the mottling is then carried out in separate booths on the dried enamel. The reason for this practice is to assist in matching the mottle, which, of course, is very important where a dark base colour is used. In this case there are ten sprayers and four mottlers. Therefore, there are fourteen sprayers on mottle work, but the possibilities of a varying mottle are reduced to four instead of being spread over the fourteen operators, as would be the case if the mottling were carried out in all the booths.

Moreover, as the mottlers are engaged entirely on mottling, they become more proficient than if spraying and mottling alternately. Each sprayer lifts her work into the drying room (Fig. 18). These dryers are heated by the waste gases from the furnaces by means of underground flues. The drying chamber consists merely of partitioned walls with sliding doors on the long side adjacent to the sprayers and folding doors at each side of the furnace. These dryers are without roofs, and are simply open to the shop. These have now been in operation for over twelve months, and have proved their efficiency. There are two of these dryers, and a boy is engaged at each, his duty being to place the skids and trays in position as required by the sprayers. One boy can carry out this work for six sprayers, so that there is no time lost by the sprayers. As they finish a casting, they can place it immediately in the dryer on a tray, these trays being continually placed in position for them by the boy. This results in maximum output being obtained from the sprayers.

The average temperature of these drying rooms is approximately 100 deg. Fah. Obviously, the temperature varies somewhat from time to time according to the weight of the loads and the outside atmospheric conditions. The mottling booths are arranged two on each side of the furnace, adjacent to the exit doors from the dryers. The skids of sprayed work are placed at an angle of approximately 45 deg. to the front of the booth on the right-hand side of the mottler, while an empty skid is placed at approximately 45 deg. to the front of the booth on the left-hand side of the mottler. Therefore the operator can lift the sprayed castings from the right-hand side, mottle them and place them on the left-hand side without leaving her working position. The mottled ware dries, of course, in the open shop, and immediately a skid load is complete these are placed in line at each side of the charging machine.

Fusing Plant

Fig. 19 shows a general view of the department. Sufficient space is available for skids of work to be accumulated during the day shift to keep the fusers going through the night shift. There are two fusing furnaces, each 12 ft. long by 5 ft. wide, by 2 ft. 9 in. high above the landing walls. Here, again, the extra height is required, as in the case of the annealing furnace, to accommodate the hanging perrets. The working temperature on the mottled work is 740 deg. C., and in the case of the ground-coat work 800 deg. C. A considerable amount of heavy wrought iron is also enamelled in this plant with sheet-iron enamels. For this work the furnace operates at approximately 850 deg.

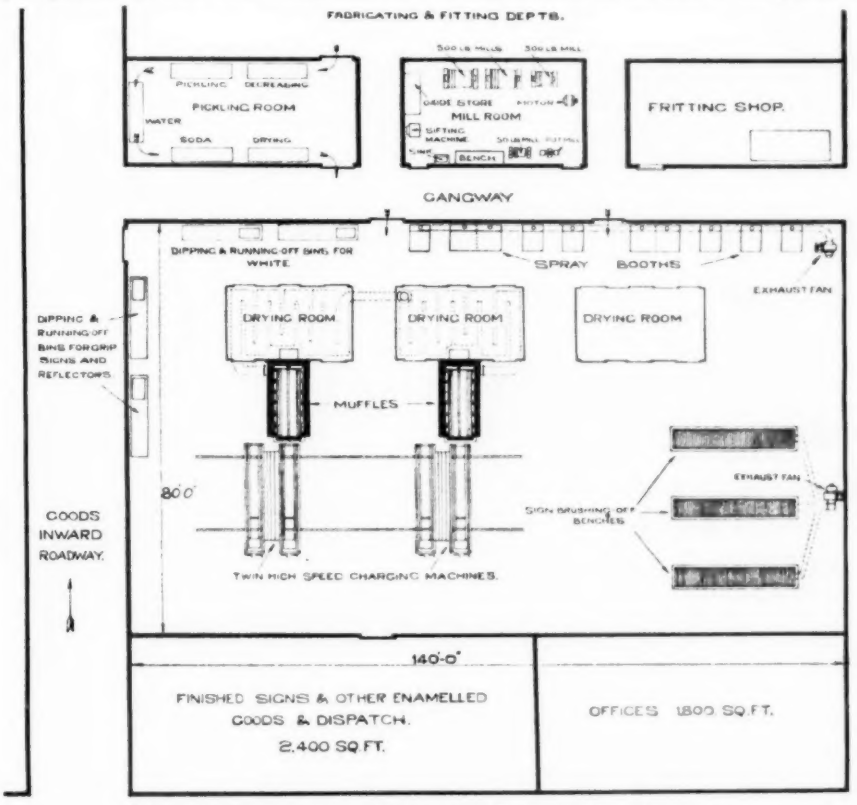


FIG. 20.—LAY-OUT OF AN ENAMELLING SHOP FOR SIGN PLATES.

C. The average oil consumption of these furnaces is 6.2 galls. of fuel oil per hour.

For an output of 35 tons per week, one furnace is fusing 24 hrs. per day and the other 10 hrs. per day. The total actual fusing hours are approximately 31 per day, so that there are 3 hrs. lost through changing over the jobs, and so on. It is interesting to note that red warning lamps are fitted to the gravity oil tanks, and these light simultaneously with the starting up of the pump, as an overflow warning.

A textile settler is used for the collecting of exhausted dust from the sandblast. The use of this settler and the settler on the spray line completely prevents the escape of enamel or any other dust into the atmosphere, and therefore the surrounding buildings are rendered free from contamination, whilst the shop is always well lighted as the roofing glass does not become covered with exhausted dust. This is worth noting, if only from a buildings-maintenance cost point of view.

Lay out for a Sheet Iron Shop

Fig. 20 shows a plan of a plant laid out for the production of signs, general flat sheet-iron ware, and a limited variety of stampings, such as reflectors. The fritting house, mill room and pickling room are divided from the main enamelling shop by a 10-ft. gangway. The ware from the fabricating departments passes through the pickling operations as indicated by arrows, and is delivered into the main shop, adjacent to the grip-coat dipping tables, and then passes from the stationary dryers to the fusing furnace. After fusing, the ware is passed to the white-coat swilling tables, as with large sign and similar flat work, the white enamel is usually swilled and not sprayed.

After fusing in white it is sprayed in the necessary colours, dried, and passed to the brushing-off benches. The tops of the brushing-off benches are perforated or formed of slats. An exhaust system is arranged below the tables so that all enamel dust being brushed off is collected in a container below the bench. The draft of this exhaust system requires to be very carefully balanced, as only a slight suction is necessary to prevent the enamel dust rising into the shop, and it need not necessarily be sufficiently strong to draw the enamel dust through the exhaust system. The enamel should fall into the container below the bench. The discharge from the exhaust system should be arranged below floor-level so as to allow the brushers to pass around all four sides of the bench for the manipulation of large signs and stencils. It is important in a plant of this description to have ample floor space for the accommodation of large sign-plates.

Conclusion

In conclusion and acknowledgment it is hoped that the Paper has emphasised the necessity for the selection of the correct type of equipment, and the importance of careful forethought being applied to the planning of the lay-out.

The author wishes to thank the directors and managements of the many companies concerned for having accorded access to their records, for giving facilities for carrying out tests in their works and for making check tests against their own figures. He also thanks Mr. J. Barry most sincerely for his assistance in the preparation of the Paper.

Iron and Steel Institute

The annual meeting of the Iron and Steel Institute will be held on May 1 to 3, under the presidency of Sir Harold Carpenter, F.R.S. The annual dinner will take place on the evening of Thursday, May 2. At the annual meeting there will be a Symposium on Welding, to be held on May 2 and 3. The latest date for receiving Papers for presentation at the annual meeting was February 12 and for the autumn meeting June 4. (The date of the autumn meeting will be announced later.)

Deoxidation and Degasification of Yellow Brass

(*Concluded from page* 89.)

PART II—DEGASIFICATION

A study of degasification of brass should include the effect of following gases:—Hydrogen, steam, air, nitrogen, carbon monoxide, carbon dioxide and methane. From the literature, brass foundrymen are particularly interested in the first three. The others either definitely are not soluble in the molten brass or only slightly so. Any gases present in the castings are from one of three sources:—(1) They may have been present in the metal going into the charge and may have been retained through the melting and casting cycle; (2) they may have been dissolved during the melting process, and (3) they may have become entrapped in the molten metal in the mould.

Further, foundrymen are not interested, primarily, in the solubility of the gases either in the molten or solid metal. It is immaterial how much gas dissolves during melting if it all stays in solution when the casting solidifies, but if the gas that is dissolved during casting is not soluble in the solid metal, trouble will be experienced with porous castings.

Importance of Gas Solubility

Of the three more important gases listed above, the first two are soluble in the molten brass and only slightly so, if at all, in the solid metal. Hydrogen may be derived from cathode copper, which contains large volumes of it, or possibly from the furnace gases. Steam can be derived from wet scrap charged into the furnace, from the furnace atmosphere or from the gases present in the mould. The solubility of both these gases decreases with a decrease in the temperature of the molten metal so that the best method of degasification available is to keep the casting temperature as low as is consistent with good casting practice. Proper venting of the moulds, so that gases released during cooling of the molten metal in the moulds can escape, is also of vital importance in degasification.

Proper control of furnace atmosphere, in the case of fuel-fired furnaces, to keep the hydrogen content of the gases at a minimum is also important. It is at this point that the use of covering agents on the molten metal becomes particularly useful. Slag coverings that prevent the furnace gases from coming into contact with the molten metal are especially good in many instances, since they protect the metal by means of a liquid film, while charcoal can only protect by means of the gas mantle which it forms.

Air is referred to as one of the important gases with which one has to contend. Too violent stirring of the metal in the pot before pouring or too turbulent a stream in pouring will entrap air. Other sources of entrapped air are poor design of the mould, inadequate venting and sometimes too hard ramming of the cope.

Casting Temperature Control Necessary

Even a well-designed mould, if not poured correctly, will produce castings with blowholes especially if the casting temperature is low. Of equal importance is proper venting of the mould. Adequate venting of the mould cannot be overemphasised, since the lack of it is undoubtedly one of the most serious causes of unsoundness of castings. With inadequate venting, the gases entrapped in pouring cannot escape, nor can the steam and other gases generated in the mould due to the molten metal. Under such conditions, blowholes, and often serious cold shots, will form.

In a previous part of this Paper mention was made of the use of fluidising agents or deoxidisers as an aid in degasification. By making the metal more fluid, they aid by allowing the gas to escape more freely, and also by making it possible to use lower pouring temperatures at which the gas is less soluble. To degasify brass, then, one must look not so much to some abstruse or difficult procedure, but rather to the obvious, but often overlooked, details.

Care should be taken in the melting to keep the atmosphere neutral or slightly reducing, and to protect the metal from the flame by some covering material in so far as possible. Mould design and pouring conditions should be carefully studied to avoid entrapping gases in the metal, and to give them a chance to escape if they do become entrapped. The temperature should be kept as low as possible to lower the solubility of gases in the metal.

Conclusion

In conclusion, this Paper may be summarised by saying that, with care in melting and casting, no deoxidising agent is necessary, and that the best method of degasification is to keep the casting temperature as low as possible and use care in melting and pouring the brass.

Acknowledgment

The writer desires to thank the Chase Brass & Copper Company for permission to publish the results given in this Paper, and Dr. D. K. Crampton for his many helpful suggestions.

The Outlook for Tin

By "UNLOOKER."

To say that the tin position is abnormal is to utter a self-evident truth, for, as all the world knows, the control of this metal has passed into the hands of an international committee, which by the establishment of quotas and other artificial restraints has succeeded in lifting the quotation to an abnormally high level. Recently, however, the appearance of a premium for spot metal of no less than £5 per ton has drawn attention to the paucity of stocks in this country, and the "hold-up" policy of the tin pool. It would be foolish to pretend that conditions ruling in tin favour the maintenance of normal trading, and evidence is not lacking that a feeling of acute dissatisfaction is growing up amongst those connected with this highly-important metal.

Whatever producers think of the present arrangement, and it is by no means certain that they are unanimous in regarding it favourably, there is not the slightest doubt that consumers are, and have been for a long time past, acutely dissatisfied. When tin stood at but little over £100 per ton, and looked like going lower, users of the metal voiced no objections to a movement set in motion to improve the price level, for they recognised that the situation was altogether abnormal, and one that called for special treatment. They cheerfully concurred in a scheme which aimed at lifting the quotation to £150 per ton, but the price has travelled nearly £100 in an upward direction since then, and may even go higher this year. Is it any wonder that manufacturers all over the world, to whom tin is a raw material, are strongly of the opinion that they have had a bad deal?

It has been said that speculation in moderation acts as a vital and refreshing force in the commodity markets, and there does not seem to be any valid reason for quarrelling with this dictum. When movements are set afoot, however, which outstrip speculation and lead to a virtual hold-up of supplies, then the user has a right to raise his voice in no uncertain protest against what, from a trading point of view, constitutes a breach of faith on the part of one of the parties to the pact of commercial relations. Recent events in pepper and shellac have clarified this point and shown plainly enough what happens as a result of interference in natural laws of

(*Concluded on page* 134.)

Speech Day in Manchester

MR. E. J. FOX ON APPRENTICESHIP FOUNDRY TRAINING

The annual dinner, whist drive and dance of the members of the Lancashire Branch of the Institute of British Foundrymen was held at the Grand Hotel, Manchester, on February 2.

Among those present were Mr. F. D. Webb, secretary of the Manchester and District Iron Founders' Employers' Association; Mr. F. W. Gaskin, Deputy Water Engineer, Liverpool; Mr. A. Phillips, Past-President of the Lancashire Branch; Mr. V. C. Faulkner, Editor of THE FOUNDRY TRADE JOURNAL; Mr. V. Delport, of the American Foundrymen's Association; Mr. H. W. Lockwood, hon. secretary of the London Branch; and Mr. J. E. Cooke, hon. secretary of the Lancashire Branch; Mr. Tom Makemson, secretary of the Institute of British Foundrymen; and representatives from many Branches of the Institute throughout the country.

Mr. W. N. Cook, B.Sc., President of the Lancashire Branch, presided over a company of well over 300.

Miss D. Miles presented a bouquet of flowers to Mrs. Roy Stubbs, and to Mrs. W. N. Cook, the wife of the Branch-President.

The Toasts

After the loyal toast had been duly honoured, MR. E. J. FOX, managing director of the Stanton Ironworks, said he would approach his subject not as a supplier of pig-iron, but as a foundryman occupied in remelting probably a larger amount of pig-iron during the week than any other foundry in the world. As recently as last October a three- or four-years' course was inaugurated at the University of Sheffield for students who had previously matriculated. This course was planned under the auspices of the Institute of British Foundrymen, and was perhaps somewhat academic in character.

Another scheme sponsored by the British Cast Iron Research Association would give a general insight into the technical and administrative side of foundry work. It was hoped to commence this scheme during the present year, at the Birmingham Technical College. The course was to be of twelve months' duration, and would be open to foundry workers who had had at least twelve months' practical training.

Another healthy sign in the foundry trade was the ever-increasing number of endorsements which the Institute added to the technical certificates granted by the Institution of Mechanical Engineers.

The Stanton Scheme

One matter which was causing some concern to all was the disinclination of boys leaving school to enter the foundry industry, and unless steps were taken the future might find them with a serious shortage of skilled craftsmen. Experience taught that even when an industry became mechanised, the proportion of highly-skilled labour was increased, any reduction being confined to the unskilled and semi-skilled classes. To try to counteract a possible shortage of skilled workers in the future, he had put into operation at Stanton a special apprentice training scheme which aimed at two things. First, the building-up of a personnel of good intellect, and, second, the ensuring of their moulders becoming real craftsmen and not merely "human machines."

In order to pick out boys who were suitable for this work, a series of tests are given before they joined. Some of these tests have been designed to show a boy's general intelligence and foresight, whilst others had reference to his special vocational aptitude. On the result of these tests, together with the impression gained by the examiner, depended the engagement of the applicant and the department of the works in which he was placed. This scheme, which had been in operation some fifteen months, was already showing good results, as in the majority of cases the quarterly reports from the foreman confirmed the conclusions of the entrance test. The only difficulty experienced was the point just touched on, namely, the shortage of applicants desirous of entering the foundry, a large proportion of the applicants preferring to enter other branches of the business and to qualify as fitters, electricians, or patternmakers.

The foundry apprentices commenced their training in a "nursery," which is a small moulding shop run by the boys themselves under the charge and direction of a highly-skilled man. One of their number acted as charge hand, and the boys were given a thorough grounding in all the principles of moulding. A careful check was kept on their work, and as vacancies occurred in the other shops, they were filled from the "Nursery." To accustom these lads to all types of moulding they were moved from shop to shop as circumstances permitted, a record being kept of their progress in each of the shops. Before the Evening Technical Class Sessions started, each boy was interviewed by the apprentice supervisor, and, although attendance at these Evening Classes was not made compulsory, the advantage of technical training was impressed upon the boy. Practically no expense was borne by the boys, as fees and travelling expenses were refunded by the Company if a sufficient number of attendances was recorded to his credit. From the boys who had received a secondary School Education the firm hoped to draw their future foremen and supervisors. For these boys the Entrance test was the same but their training covered a wider field, a short time being spent in the pattern shop, and also in the laboratory, where experience in the chemical side of foundry work was obtained.

Compositional Specifications for Pig-Iron

As a large consumer of pig-iron, and as a producer of it, he said that he would like to add a word or two on that subject. On previous occasions he had made reference to the use in the foundry of ordinary commercial pig-iron as an iron suitable for a large proportion of general castings. The wide range of grades in which this iron is available when blended with suitable scrap will give the mixture required in the resultant casting. For general work in the foundry a No. 2 or No. 3 Foundry Iron was often used on the assumption that this iron would safely carry a large proportion of circulating or other scrap, and surprise was not infrequently expressed when the resultant castings were disappointing. All producers of pig-iron published the analyses of their standard grades of iron from Foundry No. 1 to White Iron, and consequently there need be no difficulty in buying iron to analysis. But it is a recognised fact that one could undertake to produce a pig-iron to a definite fixed analysis for a particular fracture grade. For instance, it was possible to obtain a pig-iron with an open fracture but with a silicon content of two instead of three per cent. or 3.5 per cent. whilst, on the other hand, a close No. 4 fracture pig-iron may have a higher percentage of silicon than is indicated by its fracture.

This brought him to the belief that it would probably be preferable from the Foundryman's point of view to order his pig-iron to analysis, allowing limits for variation up and down, rather than to rely on fracture grade.

Chill Cast Pig-Iron

At the present time the British foundryman did not take kindly to pig-iron cast in chill moulds. As far as he could see there was really no objection to this practice, and, on the other hand, there were the two advantages that the pigs would be of uniform size, and free from adhering sand. Of course the fracture would not agree with the fracture of iron of a similar analysis cast in a sand bed; but this would be immaterial when buying to analysis, as in remelting the resultant metal would be normalised according to silicon content. The future would dictate that pig-iron for foundry purposes would be bought to analysis and would be cast in a machine.

Some few years ago he (Mr. Fox) dealt with the problem of producing iron with high physical properties; at that time advocating ordinary commercial pig-iron mixed with suitable scrap or steel. The difficulty, of course, was that, to obtain consistently good results by this method of mixing, one required scientific control at the cupolas, and many of the smaller foundries could not afford a chemist to analyse the material and to carry out the necessary control of the cupolas.

During the past few years there had been great developments in the production of high-duty and refined irons, and he believed that the future had much in store for development in these directions. A small percentage of refined iron added to the ordinary foundry mixture would give the required closeness in texture and additional strength to produce castings of exceptional strength.

There were to-day available to the foundryman a sufficient number of grades of iron to enable him by proper selection to produce a mixture covering a wide range of castings, and these mixtures could be made available at comparatively low costs by using commercial pig-iron as a base.

Attracting the Artisan

The PRESIDENT OF THE INSTITUTE (Mr. Roy Stubbs), in responding to the toast, said that by joining the Institute the most important unit, the practical craftsman—that invaluable man—whose skill was second to none, could gain access to technical information that would enable him to become a technician. This was a point that was often forgotten, and should be made more of; that one of our main objects was to endeavour to combine practice and theory—the two go hand-in-hand—and the craftsman who could assimilate the knowledge dispensed by collective resources was the man to cultivate for membership.

Some remarkable results had already been achieved by the efforts of the Institute, and the sooner it was realised that they were a national institute, doing national work of national importance, the greater would its value to the industry appreciate. Since its inception no one could deny it had been identified with almost every major refinement of foundry practice in Great Britain. Through membership of the Institute the industry received the very best material available for improvement of casting practice.

"The Lancashire Branch"

MR. A. HARLEY, Past-President of the Institute, proposed the toast of "The Lancashire Branch," and, in doing so, thought it was appropriate to mention the names of a few of the older members of the Branch, because sometimes one was apt to forget those who had worked so well in former days. The first President of the Branch was Mr. W. Russell and the first secretary Mr. Stewart. Later, Mr. Sherburn was President, and his son, whom he understood was present that evening, acted as secretary during his father's year of office. Another early enthusiastic worker in the Branch was Mr. R. W. Kenyon, an old President and also a Vice-President of the Institute. Both Mr. Sherburn and Mr. Kenyon were now about 80 years of age and were still interested in the work of the Institute. The services which Mr. J. Hogg had

rendered to the Branch were well known among the members of the Branch, but they deserved to be better known throughout the country. He was, with the assistance of Mr. Pell, the organiser of the Burnley Section, which was now in a very flourishing condition. The Preston Section was chiefly associated with the name of Mr. Walter West.

Lancashire had also a very prosperous Junior Section, founded in 1924, chiefly by the efforts of Mr. W. Jolley and Mr. Tom Makemson, and which had now a membership of 110, ably presided over by Mr. A. L. Key.

Other gentlemen who were well known for their work in connection with the Branch were Mr. R. A. Miles, Mr. E. Longden, Mr. E. Flower, Mr. A. Phillips and Mr. S. G. Smith, who has so recently been made an honorary member.

Five conferences in connection with the Institute had been held at Manchester, the last being in 1934, when Mr. Roy Stubbs was installed as President.

He was told that the Lancashire Branch was the largest in the Institute, and, in his opinion, it was perhaps the healthiest. Its members were certainly very enthusiastic in teaching the young idea how to make castings.

MR. NORMAN COOK, B.Sc., President of the Lancashire Branch, in responding to the toast, said that, though Lancashire people could not claim to be the originators of the Institute, nevertheless, as Mr. Harley said, they formed the first and largest Branch functioning at present. The average attendance at the lectures during the past session was well over 100, in spite of the fact that the members were scattered over a wide area. There were really, in effect, three Branches in Lancashire with three different sets of lectures. Having regard to the fact that the lectures were delivered on Saturday afternoons, the attendance of the members was something of which to be proud.

"The Guests"

MR. R. A. MILES proposed the toast of "Our Guests." There were two Past-Presidents of the Institute present, namely, Mr. A. Harley and Mr. V. C. Faulkner, both of whom had rendered yeoman service to the organisation. The American Foundrymen's Association were represented by Mr. Delport, while the London Branch of the Institute was represented by its hon. secretary, Mr. Lockwood, as was also the Middlesbrough Branch by its secretary, Mr. Harper. There were also other representatives present from London, the Midlands and from the North, South, East and West.

There were two of the original members of the Institute present that evening, namely, Mr. W. R. Wilson and Mr. W. H. Meadowcroft. Two past-secretaries of the Lancashire Branch present must feel that the magnitude of the Branch dinners was now considerably increasing, namely, Mr. J. Hogg and Mr. Harry Sherburn.

PRINCIPAL B. MOUAT JONES, D.S.O., M.A., of the Manchester College of Technology, responded to the toast. He wished he was able to say, on behalf of the College of Technology, that they were doing a great deal more in the interests of the foundry industry. He hoped that the time would soon arrive when he could speak in a different strain. Nevertheless, the College had been doing something for years, and their present President was one of the results. Close co-ordination between science and practice was a matter of very great importance to every industry.

Presentation of Diploma

The President of the Institute, Mr. Roy Stubbs, then presented the Diploma of the Institute to Mr. Tom Makemson, General Secretary of the Institute, which had been awarded by the London Branch to the General Secretary for his Paper on "The Foundry Industry of Czecho-Slovakia." Owing to indisposition it had not been possible to present the General Secretary with the Diploma on the occasion of the London Branch Dinner.

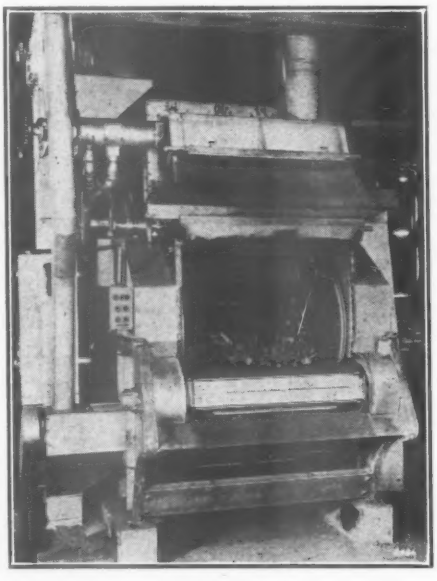
MR. TOM MAKEMSON, in acknowledging the presentation, said that he desired to tender to the London Branch his very sincere thanks for recommending his name as a suitable recipient for the Diploma.

Original Members

It was subsequently stated by MR. J. S. G. PRIMROSE, to our representative, that there were still 16 original members on the active list of the Institute, of whom six were members of the Lancashire Branch, two of them, as previously stated, being present at the dinner.

Abrasive Cleaning Without Compressed Air

The desirability of being able to clean castings, forgings, sheets, etc., without the use of compressed air has been recognised for many years. Actually, patents on the idea of employing impelling wheels were taken out as early as 1870, but none of these devices has ever worked successfully for three main reasons:—(1) The action of the wheel proved self-destructive; (2) the critical speeds were not discovered; and (3) the direction of abrasive delivery could not be controlled.



THE WHEELABRATOR.

These difficulties have been overcome in the equipment of the American Foundry Equipment Company, who, while not claiming credit for the basic idea, do claim credit for segregating, utilising and bringing under control the principles involved. This control was accomplished only after years of effort, involving literally thousands of tests. No great difficulty was encountered in obtaining actual cleaning efficiency, but protection of the device itself and directional control of the abrasive proved knotty problems.

Three Forces Controlled

It was discovered that three forces must be employed to obtain results, namely, centrifugal, tangential and air dynamic. The difficulty was, however, to bring these forces under control. First, there was the problem of protecting the device from self-destruction, as the action of the abrasive on the housing, handling mechanism and wheel itself, nullified the value of the work done by the device.

Directional Control

Secondly, directional control of the abrasive was found elusive, and this problem proved very difficult. Only after months of discouraging experiments was it solved. This feature has now been developed to the extent that practically all but the rebounding abrasive can be delivered in any direction desired. When this problem was solved, the means proved simple, as in the case of the problem of protection. Directional control has been responsible for increasing efficiency tremendously, as effective results can now be obtained from practically all abrasive thrown by the wheel. The abrasive can literally be placed wherever desired, either downward, upwards, or to right or left side of the wheel. Naturally, each step of accomplishment has been covered by patent application

The abrasive is thrown in a stream about 4 in. wide, and the most effective working distance is 9 in. to 12 in. from the periphery of the wheel. The length of effective blast stream may be varied between 10 in. to 40 in.

Constructional Details

The Wheelabrator head itself consists of a specially-constructed wheel, in which shot is fed by gravity from a storage hopper. The shot is discharged at high velocity by centrifugal force, and due to the rate of discharge and effective area covered, the rate of cleaning exceeds that of high-pressure blasting. By eliminating the use of compressed air, the Wheelabrator effects a remarkable saving in horse-power. At 80 lbs. pressure, three abrasive nozzles require 100 to 200 horse-power, depending on the size of nozzles between $\frac{5}{16}$ and $\frac{1}{2}$ in. The Wheelabrator will do equivalent work, using a maximum of 15 horse-power. This saving is effective as long as the machine is operated.

Wide Application

While originally developed for the foundry industry, the application of the Wheelabrator in the metal working field is assuming wide proportions. It successfully replaces acid pickling, wire brushing, abrasive scrubbing and other methods of cleaning sheets, shapes, billets and forgings. Billets 4 in. wide of high carbon steel are cleaned of scale at the rate of 60 ft. to 90 ft. per min., and hot- and cold-rolled sheets approximately 36 in. wide, are cleaned at the rate of 7 ft. to 25 ft. per min.

The Wheelabrator is capable of wide application. Practically every type of stationary equipment, in which the work to be cleaned can be moved to the stationary unit, is suitable for Wheelabrator application, and the method is especially suitable for automatic and semi-automatic machines.

All users of pressure blasting equipment will appreciate the advantages of a cleaning method where no compressed air is required. Air compressors, receivers, nozzles, piping fittings, motors for compressors, etc., are all eliminated.

Wheelabrator equipment is the development of the American Foundry Equipment Company, Mishawaka, who have appointed Pneulec, Limited, Mafeking Road, Smethwick, near Birmingham, as sole licensees for the manufacture and sale for the British Empire, excluding Canada. We understand that a Wheelabrator Tum-Blast, which provides a tumbling action in addition to the abrasive action of the Wheelabrator, will be demonstrated at the British Industries Fair, Birmingham, in May.

Continental Blast-Furnace Practice

At a meeting of the Cleveland Institution of Engineers, held at Middlesbrough on January 14, Mr. G. B. BUTLER read a Paper on "Blast-Furnace Practice in Belgium and Luxemburg," which was based on observations made during the autumn meeting of the Iron and Steel Institute. With regard to hearth diameter, the author expressed the opinion that, in view of Continental practice, hearths of British furnaces could be increased to 17 ft.

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Metallurgical Research

EXTRACTS FROM THE ANNUAL REPORT OF THE D.S.I.R.

The Annual Report* of the Department of Scientific and Industrial Research for 1933-34 has been issued, and we append some extracts dealing with metallurgical research.

Creep and Growth in Cast Irons

Research on the creep and growth of cast irons has been continued in co-operation with the British Cast Iron Research Association, and data have been obtained concerning the mechanical properties and structural changes occurring at temperatures up to 538 deg. C. of ordinary cast iron, nickel-chromium cast iron, and 6 per cent. silicon cast iron. The creep resistance of the first two irons has been found to be rather low owing to the comparatively high rate of growth which is independent of the applied stress. By giving a preliminary heat-treatment at 600 deg. C. the rate of growth is reduced and the creep resistance found to be considerably improved. The creep properties and structural stability of the 6 per cent. silicon cast iron and of two austenitic cast irons are also being investigated at temperatures up to 850 deg. C., at which temperature it is also proposed to examine their resistance to oxidation.

The creep properties and structure of two chromium-molybdenum steels suitable for superheater tubes have been examined both in the condition as received and after various heat-treatments. Work on the effect of prolonged heat-treatment at 450 deg. C. on the notched-bar brittleness of certain steels has been continued so as to show the influence of testing at various temperatures between 20 deg. C and 450 deg. C. The investigations on the influence of the initial condition of steels on their creep properties, recovery after creep, and creep under combined stress, are proceeding, whilst an investigation of the nature of creep under stresses produced by pure flexure is being completed.

The study of the nature and mechanism of creep in commercially-produced forms of iron and mild steel has continued throughout the year. As a preliminary to the investigation of the relation of age-hardening to creep performance of nickel-silicon-copper alloys, the age-hardening of alloys containing 3 and 5 per cent. nickel plus silicon (in the atomic ratio 2 Ni/1 Si), with and without additions of manganese, has been studied at temperatures between 250 deg. C. and 765 deg. C. after quenching from 900 deg. C. Arising from this work a comprehensive survey of the literature of age-hardening has been completed and some phenomena of age-hardening have been considered in view of their possible bearing in relation to creep performance.

The research for new ferrous materials is being continued at the National Physical Laboratory under the supervision of the Joint Committee of the British Electrical and Allied Industries Research Association and the British Iron and Steel Federation. As a result of the work on carbon steels, it has been concluded that their resistance to creep is not markedly affected by increase in carbon content from 0.15 per cent. to 0.4 per cent. The addition of 0.5 to 1 per cent. molybdenum has been shown to improve steels of these carbon contents, but the previous thermal treatment is of great importance if the high resistance to deformation at elevated temperatures is to be utilised. The occurrence of inter-crystalline cracking in molybdenum steels has been noted in tests at temperatures and stresses higher than those which could be used in the case of carbon steels. This is being investigated, and a number of complex molybdenum steels are being prepared and tested with the object of finding elements which, when added in small quantities, would eliminate this type of failure at 550 deg. C. without adversely affecting the high creep resistance. Tests for corrosion in flue gases and in superheated steam under pressure are being carried out on the materials developed.

Research on Light Alloys

Considerable progress has been made during the year in researches on magnesium alloys at the National Physical Laboratory. Some work has also been carried out on aluminium alloys and a little consideration given to beryllium.

Specimens of rolled, pressed, extruded and spun magnesium alloy have been produced at the National Physical Laboratory. The mechanical properties of these alloys have been studied as rolled and after further heat-treatment. One alloy, containing 8 per cent. cadmium, 2 per cent. zinc and 6 per cent. aluminium, had an ultimate tensile strength of 26 tons per sq. in. and an elongation of 10.5 per cent. on the rolled rod. Some corrosion tests on selected alloys are to be carried out in collaboration with the Royal Aircraft Establishment. Further, in view of the difficulty experienced in working some of the magnesium alloys, a study of the more fundamental problem of the relation between the nature of deformation and the lattice orientation is contemplated.

Magnesium-nickel alloys containing up to 50 per cent. nickel have been investigated by thermal and microscopic methods. The solid solubility of nickel and solid magnesium is found to be less than 0.1 per cent. Some exploratory work has shown that the alloys are unlikely to have useful mechanical properties.

Some experiments have been carried out to find whether an adherent coating of cadmium can be produced on a magnesium alloy by rolling together strips of cadmium and magnesium. The first experiments were successful and the coating appears to be a good basis for the electro-deposition of further coatings, but unless extremely thin coatings can be achieved, the advantage gained may be outweighed by the disadvantage of an increase in specific gravity.

An investigation has been made to discover if a beam test for cast aluminium-alloy bars is more satisfactory than the tensile test in the measurement of ductility in bars of low elongation. Up to the present, the bend test applied to sand-cast bars has yielded no information concerning ductility which cannot be obtained as readily from the tensile test. Bend tests of machined and unmachined bars have given satisfactory agreement so far as it is practicable to carry out a beam test without machining operations.

Some fatigue experiments have been made on beryllium bronze to find out whether its fatigue-resisting properties are superior to those of other bronzes and most steels. The claim for this superiority has been only partly substantiated. Beryllium bronze has a higher fatigue range than that of other non-ferrous metals, but much less than that of normal spring steel. As with steel, the fatigue range is affected by the surface condition.

Steel Castings

Research on steel castings was continued at the Research Department, Woolwich, under the supervision of the Metallurgy Research Board, up to March 31 last, when the responsibility for organising industrial co-operation in the investigations was transferred to the Industrial Research Council of the British Iron and Steel Federation. Further work was carried out during that period upon the design of a test-piece for recording "fluidity" and on the strength of cast steel at high temperatures. A study has also been made of the banding effects occurring in many steel ingots and castings.

Alloy Steels

A comprehensive summary of the properties and uses of chromium steels has been prepared for publication. Reports have been written upon the effect of silicon and manganese, separately and together, on 1.8 per cent. chromium steel and upon the constitution and properties of pure tantalum-iron alloys and steels. Patent applications have been made to cover the industrial uses of some of the tantalum alloys. The properties of a series of low-carbon steels containing 0.5 per cent. chromium and 1.5 to 4.0 per cent. copper are being investigated, with particular reference to temper-hardening. The effect of vanadium on a series of carbon, chromium, nickel and nickel-chromium steels when heat-treated to produce a temper-hardening effect has been investigated.

Oxides in Steel

The apparatus for the determination of oxides in steel by the hot-extraction method has been completed, and is in operation. The iodine method for the separation and determination of inclusions in steel has been found to be satisfactory, and samples supplied by the Ingots Committee of the Iron and Steel Institute are being examined. Co-operative work on the comparison of different methods has been arranged with the Ingots Committee.

Oxidising Power of Basic Slags

An investigation is being carried out by Prof. Hay at the Royal Technical College, Glasgow, into the mechanism of the oxidising power of basic slags, as a continuation and development of the research on inclusions in steel recently completed at the College. The determination of the binary system calcium oxide—iron oxide has been completed and the measurement of the dissociation pressures of the pure and mixed oxides is being undertaken. An optical method of identifying the constituents in basic slags has been developed.

* H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2. (Price 3s.)

Catalogue Received

Illuminations. In connection with the forthcoming Jubilee Celebrations on May 6, commemorating the 25th anniversary of the accession of H.M. King George V to the throne of Britain, the General Electric Company, Limited, has just issued a finely-illustrated brochure in colour descriptive of electrical illumination devices, floodlights and floodlighting applications, neon applications, and general decorative settings expressly designed for the Jubilee Celebrations. The publication describes and illustrates illuminated devices of various descriptions suitable for public and other buildings, appropriate floodlighting material and a wide range of photographs of outstanding G.E.C. floodlighting installations, Claudegen neon illuminated decorations, together with selected accessories suitable for all decorative lighting purposes.

Wear-Resisting Gears

The following composition is now being extensively used for large gears used by the Pusey & Jones Corporation, Wilmington, U.S.A.:—Total carbon, 3.25; silicon, 1.35; manganese, 0.80; molybdenum, 0.50 per cent. The iron has a Brinell hardness of about 200 and is easily machinable.—"Steel."

Hydrogen-Cracking of Steel

In "Die Naturwissenschaften," P. BARDENHEUER and H. PLOUM discuss the absorption of hydrogen by steel, and point out that the removal of the gas does not restore completely the original properties to the metal. The degree to which the metal is affected depends on the rapidity with which the hydrogen is removed; flaws always remain in the metal after the gas has been evolved. The evolution of hydrogen at room temperature may be accelerated by cold-working.

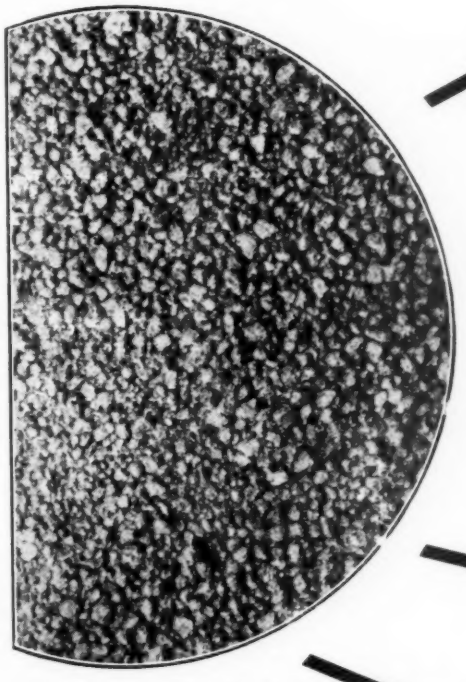
XUM

RED ROVER

Nature has endowed the British Foundryman with RED ROVER SUPERFINE SAND, a fine-grained, well bonded moulding sand, to enable him to produce castings with unblemished skin.

Those who have taken advantage of her bounty, find Red Rover Sand to be particularly suitable for castings where "finish" counts, such as for STOVE GRATE work, LIGHT CASTINGS, etc. Red Rover Sand gives just as good results for drysand moulding as for greensand.

This photograph (8 times magnification) shows its high porosity, which helps to minimise scabbing.



Red Rover Superfine Sand (magnification. × 8).

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This Week's News in Brief

Trade Talk

MESSRS. WILLIAM BEARDMORE & COMPANY, LIMITED, Parkhead, Glasgow, have secured a large order for tyres and axles from Messrs. Arcos, Limited.

THE DIRECTORS OF Messrs. Hadfields, Limited, Sheffield, have decided to make full restoration of the cuts in salaries of directors and staff made in 1932. A partial restoration was made in April last year.

ORDERS AMOUNTING to approximately £100,000 in value have been received by Craven's Railway Carriage & Wagon Company, Limited, Darnall, Sheffield. They include one from the L.N.E.R. for 36 carriages.

MESSRS. R. Y. PICKERING & COMPANY, LIMITED, Wishaw, have secured a large order for new carriages and rolling stock from the L.N.E. Railway Company. The value of the order is stated to run to six figures and will provide employment for many men for some months.

A FACTORY is to be started in Glasgow for the manufacture of an American patent motor-car fitting —an electrically-heated panel designed to keep windscreens free from ice or snow. The new factory at Port Dundas is in course of equipment, and it is expected that 150 or 200 men will be employed.

CONTRIBUTIONS TO HOSPITALS and other charitable institutions have been made by the following firms : —The Atlantic Engine Company, Limited, Wishaw, £80 16s. 8d.; Messrs. Butters Bros. & Company, Limited, Crane and Engineering Works, Glasgow, £79; Messrs. Harland & Wolff, Limited, Clyde Foundry, Glasgow, £208.

SUBJECT TO THE ADJUSTMENT of certain details Messrs. Yarrow & Company, Limited, Scotstoun, Glasgow, are to build H.M.S. "Protector," a net-laying vessel of the Admiralty 1934 programme. The vessel will in the main be similar to H.M.S. "Guardian," built at Chatham in 1932. The contract will provide employment for between two and three hundred men for approximately a year.

A PARTY of about 40 of the senior students attending the classes in patternmaking and foundrywork at the Glasgow Corporation Trades School was privileged by the kindness of Messrs. Drysdale & Company, Limited, the well-known pump makers, to visit their works at Yoker recently. The party was conducted through the various departments by Mr. Drysdale, director, and Mr. Russell, works manager.

THE ARDROSSAN DOCKYARD COMPANY, LIMITED, have received an order from Messrs. Lynch Bros., Limited, London, to build a Diesel-driven paddle tugboat. The vessel, which is the first of its type to be built on the Clyde, is an independent paddle-wheel Diesel tug propelled by two main engines each coupled to the paddle wheel through a clutch, patent flexible coupling and a ten-to-one reduction gear. The vessel is designed for towing two 300-ton lighters on the River Euphrates.

MR. R. A. KIRBY, the newly-appointed managing director of Messrs. George Turnbull & Company, Limited, presided at the annual social meeting and dance of the staff and employees. Mr. Kirby, in the course of a general review of past activities, present trade conditions and future prospects of refractory materials, sounded an encouraging note of optimism. As bearing upon the firm's future policy he said that the company intended to develop the firebrick trade at Dykehead works by making extensive alterations and additions. Mr. J. A. Cameron, agent for the firm, proposed a vote of thanks to the directors.

THE BRITISH CAST IRON RESEARCH ASSOCIATION has elected the following new members :—Ordinary Members : Australian Iron & Steel, Limited, Port Kembla, N.S.W., Australia (Representative : Mr. R. J. Burns); Charcoal Iron Company, Limited, Barrow-in-Furness (Representatives : Mr. A. While and Mr. A. J. While); R. W. Collin & Company, Sunderland (Representative : Mr. T. S. Collin, B.Sc.); Kerr & Company (Maryhill), Limited, Glasgow (Representative : Mr. T. Guthrie Young); Vithal Purshotum & Son, Bombay, India (Representative : Mr. N. V. Purshotum). Associate Member : Mr. A. Dyson, Tipton.

THE BRITISH THOMSON-HOUSTON COMPANY, LIMITED, Rugby, has received an order for a 75,000-kw. turbo-alternator from the County of London Electric Supply Company, Limited. This is the third set ordered from the company for the same power station. They have also received orders from the Lancashire Electric Power Company for a 50,000-kw. turbo-alternator, the alternator for which will be wound for 33,000 volts, and from Messrs. Balfour, Beatty & Company for a 30,000-kw. turbo-alternator for the Derby & Notts Electric Power Company, Spondon Power Station. All these machines will be manufactured at Rugby.

IT HAS BEEN OFFICIALLY ANNOUNCED that Messrs. Henry Robb, Limited, Leith, have arranged to purchase the goodwill, plant and buildings of the firm of Messrs. Ramage & Ferguson, Limited, Leith. The two yards are adjacent to each other, and with the additional accommodation and plant Messrs. Robb hope to be able to extend their activities. Mr. Henry Robb, the managing director, before founding the business which bears his name in 1918, was shipyard manager to Messrs. Ramage & Ferguson, Limited, who were then almost entirely engaged on Admiralty work, and the new company have hopes of bringing to Leith a share of future Admiralty work. Messrs. Henry Robb in recent times have built the two largest and fastest motor coasting vessels in the British trade. At present they have a still larger motor-coaster in hand.

LARGE ORDERS FOR RUSSIA have been placed with Messrs. Colvilles, Limited, Dalzell Steel Works, Motherwell. The merchant-mill department started on the material on Sunday night, and it is hoped to turn out several hundred tons per week for a lengthy period. The company is not inclined to light up extra furnaces to cope with the orders actually in hand, because of an evident fall-back in the demand for steel. Although a large number of specifications for shipbuilding steel are expected in the immediate future, the steel companies are anxious about the future in case shipbuilding should fail to maintain its advance. In the meantime, the structural trade is getting busier. It is stated that a good deal of structural work has been held back pending more settled conditions in the trade, and now that the structural engineers have a scheme of organisation in being, potential buyers are becoming actual buyers. The Motherwell Bridge Company, Limited, Alex. Findlay, Limited, and other firms are sharing in the work available.

Contracts Open

Dawlish.—1,100 yds. of 5-in. main, for the Dawlish Gas & Coke Company, Limited. Mr. H. Versey, manager and secretary.

Marchlyn.—Nine miles of spun-iron pipes, valves, etc., for the Gwyrfai Rural District Council. Mr. R. T. Griffith, clerk, Gwyrfai Rural District Council Offices, 22, Castle Square, Caernarvon. (Fee £2 2s., returnable.)

Wellingborough, March 1.—6,000 yds. of cast-iron pipes, valves, etc., for the Wellingborough Rural District Council. Messrs. Pick, Everard, Keay & Gimson, 6, Millstone Lane, Leicester. (Fee £2 2s., returnable.)

New Companies

(From the Register compiled by Jordan & Sons, Limited, Company Registration Agents, 116 to 118, Chancery Lane, London, W.C.2.)

Keebie & Simmonds, Limited.—Capital £100. Mechanical engineers, ironfounders and tool makers. Subscriber: D. J. Moir, 1-3, St. Paul's Churchyard, London, E.C.4.

Joseph Hepworth & Son (Bradford), Limited.—Capital £20,000. Manufacturers of piston rings and other components for internal-combustion engines. Directors: G. A. Hepworth, Woodlawn, Apperley Bridge, near Bradford; W. Smith and J. H. Lockwood.

MISS E. CHRISTINE ELLIOT (Mrs. Kenneth Hill), hon. secretary of The Institute of Vitreous Enamellers, informs us that her new telephone number is Putney 1896.

British Industries Fair.—The London Section of this Fair, to be held at Olympia and the White City, will run from February 18 to March 1.

Obituary

MR. JACK HALL, of Sheffield, who died last week, was for 43 years in the employment of Messrs. Edgar Allen & Company, Limited.

MR. JAMES E. ATKINSON, of Rundle Road, Nether Edge, for 34 years chief chemist at the Sheffield Testing Works, Limited, died recently.

MR. WILLIAM S. WATSON, director of the Ailsa Shipbuilding Company, Limited, died last Friday. Mr. Watson was associated with the firm of Dunsmuir & Jackson before he went to the Ailsa Company as manager.

MR. DANIEL ROBERTSON, J.P., who was managing director of Messrs. Robertson, Love & Company, Limited, brick and fireclay works, Bathville, Armadale, and when the firm merged with the United Collieries, Limited, continued as manager, died on Sunday.

MR. THOMAS ALEXANDER BOYD, chairman of Messrs. J. & T. Boyd, Limited, Shettleston Iron Works, Glasgow, died at his home in Glasgow on February 6. Mr. Boyd, who was 86 years of age, was a native of Paisley, and started business about 60 years ago as a maker of textile machines. Later, in conjunction with his brother, the late Mr. John Boyd, he started the present works at Shettleston. Mr. Boyd held a number of patents in connection with textile machinery, and in recent years had, in addition to the brass and textile foundries, been concerned with jobbing and general engineering castings for the trade.

MR. THOMAS SUGDEN, of Messrs. T. Sugden, Limited, London, engineers and contractors, has died at the age of 85. Mr. Sugden was a native of Oldham. He took up an appointment with the Manchester Steam Users' Association and later was appointed chief mechanical engineer to a firm of colliery owners. Subsequently he was associated with Messrs. Babcock & Wilcox. In 1902 he founded the firm of T. Sugden, Limited, manufacturers of superheaters. He was a member of the Institution of Civil Engineers and of the Institution of Mechanical Engineers, and was a Past-President of the Whitworth Society. He had been a member of the South Wales Institute of Engineers since 1900 and was elected Vice-President in 1923.

Applications for Trade Marks

The following list of applications to register trade marks has been taken from the "Trade Marks Journal" :—

"CRITON."—Pumps. Pulsometer Engineering Company, Limited, Nine Elms Ironworks, Oxford Road, Reading.

Application to the Cutlers' Company, Sheffield.

"FIRTHAG."—Iron and steel. Thos. Firth & John Brown, Limited, Atlas and Norfolk Works, Savile Street, Sheffield.

A Simple Machine for Coremaking

(Concluded from page 122.)

with the disappearance of the wearing or scoring of the coreboxes and the uniform flow of the air-free sand, the air consumption of the Rocket Patent coremaking machine is less than half previous practice, and no motors are required.

The machine is simple but robust in design. Maintenance cost is stated to be negligible. No foundations are required for its installation; it is merely bolted on to the coremaker's bench. Sand is fed to the sand container of the machine by hand in a few seconds, or an overhead bunker can deliver it direct to the container, which swings out on one of the vertical columns seen in the photograph.

Various sizes of Rocket coremakers are available. In some models the corebox table is adjustable in height by a substantial square-threaded screw lift. Instantaneous closing up of the corebox to the sand container is obtained by a pneumatic piston, which forms part of the corebox table. We are indebted for details of the Rocket Patent coremaker to Foundry Engineers, Limited, of Halifax, who are handling this equipment.

"FEL" Products

Specialists in Foundry Equipment

The Great Importance of Properly Prepared Sand cannot be over emphasised.

□

We are assisting well-known Foundries.

□

The RESULTS have Justified their Confidence.

CONSULT US NOW.

FOUNDRY ENGINEERS LIMITED,

HALIFAX, YORKS.

Telegrams: "Fel" / Telephone: 61459 } Halifax.

Raw Material Markets

Although confidence in the commodity markets has been rather shaken recently, there is no falling off either in the production or consumption of iron and steel; indeed, the tendency is rather towards a gradual expansion. A hopeful sign is the placing of more orders with the shipyards, which should eventually bring work to the marine-engineering foundries. Certain other branches of the engineering trade have also increased their activity lately.

Pig-Iron

MIDDLESBROUGH.—New business in Cleveland foundry iron is still on a limited scale, as most of the big consumers are covered by contracts which have still some weeks to run, but it is expected that purchasing for the spring requirements will not be long delayed. The heavy deliveries of iron being taken are an indication of the increased activity in the consuming trades as compared with recent years. The export trade also is assuming a slightly more hopeful aspect. Prices of pig-iron for shipment are inclined to stiffen, but there has been no variation in the quotations to British consumers, which for No. 3 Cleveland G.M.B. are 67s. 6d. per ton delivered Middlesbrough, 69s. 6d. delivered North-East Coast, 67s. 3d. delivered Falkirk and 70s. 3d. delivered Glasgow.

A substantial tonnage of East Coast hematite has been sold for delivery over the next two months, to consumers in this country, particularly in the Sheffield and Birmingham areas. Quotations are firm, No. 1 grade being at a minimum of 69s. per ton delivered Middlesbrough, with varying differences for other zones.

LANCASHIRE.—Although conditions in the iron-using trades in this area vary, the general experience is that the demand for iron is well maintained. A few replacement contracts have been booked by the Midland makers of foundry iron. It is reported that the West Coast ironmasters have met with some success in their efforts to push a special iron in competition with Indian brands. The general price position is firm, with offers of Staffordshire, Derbyshire and Lancashire brands of No. 3 foundry iron, for delivery to foundries in the Lancashire zone, all on the basis of 74s. per ton, with Northants at 72s. 6d., Derbyshire forge at 69s., Scottish No. 3 at from 81s. 6d. to 82s. 6d., West Coast hematite at about 78s. 6d., and East Coast at from 75s. to 76s., according to grade.

MIDLANDS.—The foundries in this area are generally well employed, with the exception of those engaged in the light-castings trade, who are definitely not so well off as they were at this time last year. The falling off is in connection with building castings, but it is expected that the demand for these will show an early expansion. The reaffirmed prices for Midland brands of pig-iron, which include delivery to Birmingham and Black Country stations, are 67s. 6d. for Northants No. 3 and 71s. for Derbyshire, Lincolnshire and North Staffordshire No. 3, these prices being subject to a small graduated rebate to large consumers. As regards irons of special analysis, there are three groups: Medium phosphorus at prices between 72s. and 80s., low phosphorus at 85s. to 87s. 6d., including Scottish iron at the former figure, and refined iron for engine and similar work at from £5 7s. 6d. to £6 10s. per ton delivered the South Staffordshire area. There is no alteration in the general position affecting the hematite market. The present controlled rates delivered this area for No. 3 are £3 18s. for East Coast and £4 4s. 6d. for West Coast.

SCOTLAND.—Trading is still inclined to be slow on the Glasgow pig-iron market. The demand for Scottish foundry iron is rather disappointing, but regular shipments of English iron are being received. Scottish No. 3 foundry remains at 70s. per ton f.o.t. furnaces, with 2s. 6d. per ton extra for No. 1. No. 3 Cleveland is still 67s. 3d. f.o.t. Falkirk and 70s. 3d. f.o.t. Glasgow.

Coke

Cupola coke is not an active market at the present time, the reason being that the ovens are already heavily sold over the winter months. Although there is an upward tendency in furnace-coke prices, no change has occurred in the foundry-coke scale. Current quotations for delivery in the Birmingham area are as follow:—Best Durham grades, 36s. to 40s.; other grades down to 34s.; Welsh, 35s. to 45s. per ton, according to tonnage and analysis.

Steel

Business has suffered only a slight reaction, such as might have been expected from a general weakening in confidence resulting from the disturbed conditions in some commodity markets. Many consumers have adopted a rather conservative attitude, but this is probably a passing phase, as the industry is in a sound position. Most of the works have a large tonnage of contracts in hand, and the consuming trades still have important requirements to cover. The demand for semi-finished steel materials is quiet, but the British producers are making satisfactory deliveries to the consuming works. Few transactions in imported Continental material have been reported since the application for an increase in the import duties was announced. In the finished-steel section business has been somewhat irregular, but, on the whole, there is a tendency for it to expand. Practically all the steelworks are well employed, and there is a good deal of work reaching them as a result of the recent railway, shipbuilding and engineering orders.

Scrap

Scrap iron is generally a firm market. In the Cleveland area, there is a steady demand for good machinery metal at 54s. per ton delivered, with some merchants asking 55s., while 52s. 6d. per ton and upwards is being paid for foundry cast-iron scrap. In the Midlands, heavy machinery metal is at 55s. to 56s., good heavy pipe and plate at 50s., and clean light scrap at 47s. 6d. In South Wales there is only a limited demand for heavy and machinery grades of scrap-iron, quoted at 50s. to 51s. 6d. and 52s. 6d. to 55s. respectively. Machinery cast-iron scrap is being bought freely in Scotland at around 56s. per ton.

Metals

Copper.—The upset in the commodity markets, and the failure of a Metal Exchange firm on Friday, caused some disturbance in the copper market, but not to the extent that might have been expected. Although the firm in question is stated to have liquidated some 15,000 tons of copper in recent weeks, it has been absorbed by the market without any serious recession in values. Indeed a stronger tone is already apparent, and quotations are expected to make an early recovery once buyers have fully regained their confidence.

Daily quotations :—

Cash.—Thursday, £27 1s. 3d. to £27 2s. 6d.; Friday, £27 1s. 3d. to £27 2s. 6d.; Monday, £27 7s. 6d. to £27 8s. 9d.; Tuesday, £27 5s. to £27 6s. 3d.; Wednesday, £27 1s. 3d. to £27 2s. 6d.

Three Months.—Thursday, £27 6s. 3d. to £27 7s. 6d.; Friday, £27 6s. 3d. to £27 7s. 6d.; Monday, £27 12s. 6d. to £27 13s. 9d.; Tuesday, £27 10s. to £27 11s. 3d.; Wednesday, £27 6s. 3d. to £27 7s. 6d.

Tin.—Quotations for this metal have suffered a setback during the past week, but the market remains under firm control.

"Consumption is reported to be satisfactorily maintained, with a tendency to develop favourably, but whilst so much uncertainty prevails, particularly with regard to the control and administration of the 'buffer' stock, it is difficult to form any definite opinion as to what may be the course of prices," state Messrs. Rudolf Wolff, in their weekly report.

Market fluctuations :—

Cash.—Thursday, £232 10s. to £232 15s.; Friday, £232 12s. 6d. to £233; Monday, £230 to £231; Tuesday, £229 7s. 6d. to £229 10s.; Wednesday, £229 5s. to £229 10s.

Three Months.—Thursday, £228 17s. 6d. to £229; Friday, £228 10s. to £228 15s.; Monday, £226 10s. to £227 10s.; Tuesday, £225 7s. 6d. to £225 10s.; Wednesday, £225 5s. to £225 10s.

Spelter.—The zinc market remains fairly steady, although small fluctuations in price occur from day to day. There is quite a good demand from consumers in this country, and a slight improvement is also reported in conditions on the Continent. The result of the Import Duties Advisory Committee's inquiry into the duty on foreign spelter has not yet been announced.

Official quotations :—

Ordinary. — Thursday, £11 15s.; Friday, £11 16s. 3d.; Monday, £12; Tuesday, £12; Wednesday, £11 18s. 9d.

Lead.—"Business in the cable industry is well maintained, and the demand for building purposes has not slackened. The price, however, has suffered a slight decline. In America, despite the reduction in price which took place last week, consumers have not supported the market, and a further reduction of 10 points, to 3.50 cents, has taken place," report Messrs. Brandeis, Goldschmidt.

Day-to-day prices :—

Soft Foreign (Prompt).—Thursday, £10 2s. 6d.; Friday, £10 2s. 6d.; Monday, £10 7s. 6d.; Tuesday, £10 7s. 6d.; Wednesday, £10 3s. 9d.

Patent Specifications Accepted

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each. The numbers given are those under which the Specifications will be printed and abridged, and all subsequent proceedings will be taken.

420,103. COLES, S. O. COWPER-, and FERBRITE, LIMITED. Electroplating of rolled, drawn or extruded sections of iron, steel, or other metals, and in particular metal sheets or strips.

420,233. GIBBONS BROS., LIMITED, and WEBB, A. W. OGILVY-. Furnaces for heating metal bars.

420,277. NAAMLOOZE VENNOOTSCHAP MACHINERIEEN-EN APPARATEN FABRIEKEN. Sheathed electrodes for electric-arc welding.

420,355. SCHLOEMANN AKT.-GES. Reels for winding metal strip into coils.

420,406. TELEGRAPH CONSTRUCTION & MAINTENANCE COMPANY, LIMITED. Manufacture of magnetic alloys.

420,424. ZIMMERMANN, G. Foundry moulding machines.

420,458. KARTENBERG, F. Methods of annealing and coating wire, and band-like materials such as hoop iron.

420,461. TUCKER & COMPANY, LIMITED, J. H., and HANNAM, J. N. R Processes for preventing rusting of ferrous metals.

420,468. AKT.-GES. BROWN, BOVERI, ET CIE. Electrically-heated furnaces for heating metal sheets and the like.

420,469. STEVENS, A. H. (Bethlehem Steel Company). Treatment of metal sheets and the like.

420,474. SARAZIN, R. Electrodes for arc-welding.

420,485. TUBE REDUCING CORPORATION. Methods of and apparatus for the production of metal tubes.

The Outlook for Tin

(*Concluded from page* 126.)

supply and demand. There has been a crisis of the first magnitude in pepper. Is there to be a similar crash in tin?

Broadly speaking, the burden of supporting tin at its present high level falls upon the pool, a financial group of very considerable resources which enables the necessary support to be afforded to the market when the quotation shows any signs of sagging. There must, however, be a limit to what the pool can absorb, and since consumption has not been for some time past on too good a level, the query has perhaps become rather a pertinent one, and calculated to raise doubts in many minds as to the future stability of the tin market. Just how the slide to a lower level is to begin it is impossible to say, but by comparison with all other metals tin stands far too high, and sooner or later a change must come. In recent events, with a failure of an old-established metal-exchange firm, there are those who see the beginning of the crack which is to spread and widen in the structure of the tin edifice.

XUM

Sterling

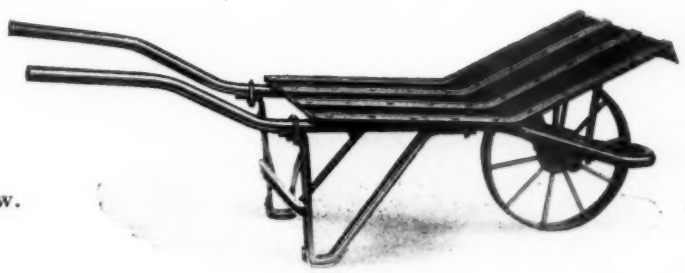
ALL STEEL TUBULAR

WHEELBARROWS

ARE IDEAL FOR ALL FOUNDRY PURPOSES.

THEY POSSESS MANY IMPORTANT ADVANTAGES.

No. 7 General Purpose Barrow.



No. 12 Pig Iron Barrow.

A Sterling Product designed for hard work and built to last.

All parts are standardised and interchangeable for repairs.

Capacities from 2½ to 6 cubic feet.

Write for Booklet W.39.

STERLING FOUNDRY SPECIALTIES LTD.

London Office:
13, VICTORIA STREET, S.W.1.

BEDFORD.

Telephone: 3345 BEDFORD.
Telegrams: "STERFLASK, BEDFORD."
Code: WESTERN UNION.

RAW MATERIALS—PRICE LIST

(Wednesday, February 13, 1935)

COPPER

	£	s.	d.
Standard cash	27	1	3
Three months	27	6	3
Electrolytic	30	0	0
Tough	29	0	0
Best selected	29	10	0
Sheets	58	0	0
India	40	15	0
Wire bars	30	10	0
Ingot bars	30	10	0
H.C. wire rods	33	10	0
Off. av. cash, January	28	2	2 1/4
Do., 3 mths., January	28	9	5 1/2
Do., Sttlmnt., January	28	2	4 7/11
Do., Electro, January	31	9	1 1/11
Do., B.S., January	31	2	6
Do., wire bars, January	31	12	11 5/11
Solid drawn tubes			9 1/2d.
Brazed tubes			9 1/2d.
Wire			6d.

BRASS

Solid drawn tubes	8 3/4d.
Brazed tubes	10 3/4d.
Rods, drawn	8d.
Rods, extd. or rlld.	4 1/4d.
Sheets to 10 w.g.	7 1/2d.
Wire	7d.
Rolled metal	6 5/8d.
Yellow metal rods	4 1/2d.
Do. 4 × 4 Squares	5 1/4d.
Do. 4 × 3 Sheets	5 1/2d.

TIN

	£	s.	d.
Standard cash	229	5	0
Three months	225	5	0
English	229	10	0
Bars	231	12	6
Straits (nom.)	229	17	6
Australian (nom.)			—
Eastern	229	10	0
Banca (nom.)	232	17	6
Off. av. cash, January	231	6	0 3/11
Do., 3 mths., January	228	16	9 10/11
Do., Sttlmt., January	231	6	4 4/11

SPELTER

	£	s.	d.
Ordinary	11	18	9
Remelted	13	0	0
Hard	10	10	0
Electro 99.9	14	11	3
English	13	2	6
India	12	5	0
Zinc dust	17	0	0
Zinc ashes	3	0	0
Off. aver., January	12	2	0 9/44
Aver. spot, January	11	19	10 7/11

LEAD

	£	s.	d.
Soft foreign ppt.	10	3	9
Empire (nom.)	11	6	3
English	12	10	0
Off. average, January	10	8	4 5/22
Average spot, January	10	6	5 1/22

ALUMINIUM

Ingots	£100 to £105
Wire	1/1 to 1/9 lb.
Sheet and foil	1/2 to 2/9 lb.

ZINC SHEETS, &c.

	£	s.	d.
Zinc sheets, English	23	0	0
Do., V.M. ex-whse.	22	12	6
Rods	26	10	0

ANTIMONY

	£	s.	d.
English	77	0	0 to 78 0 0
Chinese, ex-whse.	69	10	0
Crude			—

QUICKSILVER

	£	s.	d.	£	s.	d.
Quicksilver	11	2	6 to	11	12	6

FERRO-ALLOYS AND STEEL-MAKING METALS

Ferro-silicon—	
25%	8 17 6
45/50%	12 10 0
75%	17 19 6
Ferro-vanadium—	
35/50	12/8 lb. Va.
Ferro-molybdenum—	
70/75% carbon-free	4/6 lb. Mo.
Ferro-titanium—	
23/25% carbon-free	9d. lb.
Ferro-phosphorus, 20/25%	£14 10 0
Ferro-tungsten—	
80/85%	3/– lb.
Tungsten metal powder—	
98/99%	3/3 lb.
Ferro-chrome—	
2/4% car.	29 15 0
4/6% car.	23 0 0
6/8% car.	21 12 6
8/10% car.	21 12 6
Ferro-chrome—	
Max. 2% car.	34 0 0
Max. 1% car.	38 15 0
Max. 0.70% car.	42 0 0
70%, carbon-free	10d. lb.
Nickel—99.5/100%	£200 to £205
"F" nickel shot	£184 0 0
Ferro-cobalt, 98/99%	5/3 lb.
Metallic chromium—	
96/98%	2/5 lb.
Ferro-manganese (net)—	
76/80% loose	£10 15 0 to £11 5 0
76/80% packed	£11 15 0 to £12 5 0
76/80% export	(nom.) £9 15 0
Metallic manganese—	
94/96% carbon-free	1/2 lb.

Per ton unless otherwise stated.

HIGH-SPEED TOOL STEEL

Finished bars, 14% tungsten	2s. 0d.
Finished bars, 18% tungsten	2s. 9d.

Per lb. net, d/d buyers' works.

Extras—

Rounds and squares, 3 in. and over	4d. lb.
Rounds and squares, under ½ in. to ¼ in.	3d. lb.
Do., under ¼ in. to 1/8 in.	1/– lb.
Flats, ½ in. × ¼ in. to under 1 in. × ⅜ in.	3d. lb.
Do., under ½ in. × ¼ in.	1/– lb.
Bevels of approved sizes and sections	6d. lb.

Bars cut to length, 10% extra.

SCRAP

	£	s.	d.	£	s.	d.
South Wales—						
Heavy steel	2	15	0 to	2	16	0
Bundled shrngs.				2	7	6
Mixed iron and steel	2	10	0 to	2	11	6
Heavy cast iron	2	10	0 to	2	11	6
Good machinery	2	12	6 to	2	15	0
Cleveland—						
Heavy steel				2	12	0
Steel turnings				1	15	0
Cast-iron borings				1	5	0
Heavy cast iron	2	12	6 to	2	13	6
Heavy machinery	2	14	0 to	2	15	0
Midlands—						
Light cast-iron scrap				2	7	6
Heavy wrought iron				3	0	0
Steel turnings, f.o.r.				1	15	0
Scotland—						
Heavy steel				2	10	0
Ordinary cast iron				2	12	0
Engineers' turnings				1	19	6
Cast-iron borings	1	17	6 to	1	18	6
Wrought-iron piling				2	12	6
Heavy machinery	2	15	0 to	2	16	0

London—Merchants' buying prices, delivered yard.

	£	s.	d.
Copper (clean)	25	0	0
Brass	16	10	0
Lead (less usual draft)	9	10	0
Tea lead	6	10	0
Zinc	8	0	0
New aluminium cuttings	66	0	0
Braziery copper	20	0	0
Gunmetal	23	0	0
Hollow pewter	160	0	0
Shaped black pewter	118	0	0

PIG-IRON

N.E. Coast (d/d Tees-side area)—	
Foundry No. 1	70/–
Foundry No. 3	67/6
,, at Falkirk	67/3
,, at Glasgow	70/3
Foundry No. 4	66/6
Forge No. 4	66/6
Hematite No. 1	69/–
Hematite M Nos.	68/6
N.W. Coast—	
Hem. M/Nos. d/d Glas.	72/6
,, d/d Birm.	84/6
Malleable iron d/d Birm.	115/–
Midlands (d/d Birmingham dist.)—	
Staffs No. 4 forge	67/–
,, No. 3 fdry.	71/–
Northants forge	63/6
,, fdry. No. 3	67/6
,, fdry. No. 1	70/6
Derbyshire forge	67/–
,, fdry. No. 3	71/–
,, fdry. No. 1	74/–
Scotland—	
Foundry No. 1, f.o.t.	72/6
,, No. 3, f.o.t.	70/–
Hem. M/Nos. d/d	71/–
Sheffield (d/d district)—	
Derby forge	64/6
,, fdry. No. 3	68/6
Lincs forge	64/6
,, fdry. No. 3	68/6
E.C. hematite	81/6
W.C. hematite	83/6
Lancashire (d/d eq. Man.)—	
Derby fdry. No. 3	74/–
Staffs fdry. No. 3	74/–
Northants fdry. No. 3	72/6
Cleveland fdry. No. 3	74/–
Dalzell, No. 3 (special)	102/6 to 105/–
Glengarnock, No. 3	82/–
Clyde, No. 3	82/–
Monkland, No. 3	82/–
Summerlee, No. 3	82/–
Eglinton, No. 3	82/–
Gartsherrie, No. 3	82/–
Shotts, No. 3	82/–

FINISHED IRON AND STEEL

Usual district deliveries for iron; delivered consumer's station for steel.

Iron—	£	s.	d.	£	s.	d.
Bars (cr.)	9	12	6 to	9	15	0
Nut and bolt iron	7	10	0 to	8	0	0
Hoops	10	10	0 and up.			
Marked bars (Staffs) f.o.t.		12	0	0		
Gas strip	10	10	0 and up.			
Bolts and nuts, ¾ in. × 4 in.	14	2	6 and up.			
Steel—						
Plates, ship, etc.	8	15	0 to	8	17	6
Boiler plts.	9	5	0 to	9	7	6
Chequer plts.				10	7	6
Angles				8	7	6
Tees				9	7	6
Joists				8	15	0
Rounds and squares, 3 in. to 5½ in.				9	7	6
Rounds under 3 in. to ⅝ in. (Untested)				8	12	0
Flats—8 in. wide and over				8	12	6
,, under 8 in. and over 5 in.				8	17	6
Rails, heavy	8	5	0 to	8	10	0
Fishplates	12	5	0 to	12	10	0
Hoops (Staffs)				9	7	0
Black sheets, 24g. (4-t. lots)				10	10	0
Galv. cor. shts. (,,)				13	0	0
Galv. flat shts. (,,)				13	10	0
Galv. fencing wire, 8g. plain				14	10	0
Billets, soft	5	10	0 and up.			
Billets, hard	6	17	6 to	7	2	6
Sheet bars	5	0	0 to	5	7	6
Tin bars	5	2	6 to	5	7	6

PHOSPHOR BRONZE

	Per lb. basis.
Strip	9d.
Sheet to 10 w.g.	10d.
Wire	11d.
Rods	10d.
Tubes	13d.
Castings	10 5/8d.

Delivery 3 cwt. free.
10% phos. cop. £30 above B.S.
15% phos. cop. £35 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. CLIFFORD & SON, LIMITED.

NICKEL SILVER, &c.

	Per lb.
Ingots for raising	7d. to 1/1
Rolled—	
To 9 in. wide	1/1 to 1/7
To 12 in. wide	1/1½ to 1/7½
To 15 in. wide	1/1½ to 1/7½
To 18 in. wide	1/2 to 1/8
To 21 in. wide	1/2½ to 1/8½
To 25 in. wide	1/3 to 1/9
Ingots for spoons and forks	7d. to 1/3½
Ingots rolled to spoon size	10d. to 1/6½
Wire round—	
to 10g.	1/4½ to 1/11½

with extras according to gauge.
Special 5ths quality turning rods in straight lengths, 1/3½ upwards.

AMERICAN IRON AND STEEL

At Pittsburgh unless otherwise stated.

	Dols.
No. 2 foundry, Phila.	20.26
No. 2 foundry, Valley	18.50
No. 2 foundry, Birm.	14.50
Basic, Valley	18.00
Bessemer	20.76
Malleable, Valley	18.50
Grey forge, Valley	18.00
Ferro-mang. 80%, seaboard	85.00
O.-h. rails, h'y, at mill	36.37½
Billets	27.00
Sheet bars	28.00
Wire rods	38.00
	Cents.
Iron bars, Chicago	1.80
Steel bars	1.80
Tank plates	1.80
Beams, etc.	1.80
Skelp, grooved steel	1.70
Steel hoops	2.10
Sheets, black, No. 24	2.40
Sheets, galv., No. 24	3.10
Wire nails	2.60
Plain wire	2.30
Barbed wire, galv.	3.00
Tinplates, 100-lb. box	$5.25

COKE (at ovens)

Welsh foundry	25/– to 30/–
,, furnace	19/– to 20/–
Durham foundry	20/– to 25/–
,, furnace	17/6
Midlands, foundry	—
,, furnace	—

TINPLATES

f.o.b. Bristol Channel ports.

I.C. cokes	20 × 14 per box	18/2 to 19/2
,,	28 × 20 ,,	36/4 to 38/4
,,	20 × 10 ,,	26/– to 26/3
,,	18¾ × 14 ,,	18/6 to 18/9
C.W.	20 × 14 ,,	15/6 to 16/6
,,	28 × 20 ,,	33/– to 33/6
,,	20 × 10 ,,	23/– to 24/–
,,	18¾ × 14 ,,	16/– to 17/–

SWEDISH CHARCOAL IRON & STEEL

	£	s.	d.	£	s.	d.
Pig-iron	6	0	0 to	7	0	0
Bars-hammered, basis	16	0	0 to	16	10	0
Bars and nail-rods, rolled, basis	15	15	0 to	16	0	0
Blooms	10	0	0 to	12	0	0
Keg steel	30	0	0 to	31	0	0
Faggot steel	18	0	0 to	23	0	0
Bars and rods dead soft, st'l	10	0	0 to	12	0	0

All per English ton, f.o.b. Gothenburg.
[Subject to an exchange basis of Kr. 18.16 to £1.]

DAILY FLUCTUATIONS

Standard Copper (cash)

	£	s.	d.		
Feb. 7 ..	27	1	3	dec.	1/3
„ 8 ..	27	1	3	No	change
„ 11 ..	27	7	6	inc.	6/3
„ 12 ..	27	5	0	dec.	2/6
„ 13 ..	27	1	3	„	3/9

Electrolytic Copper

	£	s.	d.		
Feb. 7 ..	30	2	6	dec.	2/6
„ 8 ..	30	0	0	„	2/6
„ 11 ..	30	10	0	inc.	10/-
„ 12 ..	30	5	0	dec.	5/-
„ 13 ..	30	0	0	„	5/-

Standard Tin (cash)

	£	s.	d.		
Feb. 7 ..	232	10	0	dec.	5/-
„ 8 ..	232	12	6	inc.	2/6
„ 11 ..	230	0	0	dec.	52/6
„ 12 ..	229	7	6	„	12/6
„ 13 ..	229	5	0	„	2/6

Tin (English ingots)

	£	s.	d.		
Feb. 7 ..	232	17	6	dec.	2/6
„ 8 ..	232	17	6	No	change
„ 11 ..	230	12	6	dec.	45/-
„ 12 ..	229	12	6	„	20/-
„ 13 ..	229	10	0	„	2/6

Spelter (ordinary)

	£	s.	d.		
Feb. 7 ..	11	15	0	No	change
„ 8 ..	11	16	3	inc.	1/3
„ 11 ..	12	0	0	„	3/9
„ 12 ..	12	0	0	No	change
„ 13 ..	11	18	9	dec.	1/3

Spelter (Electro, 9.99 per cent.)

	£	s.	d.		
Feb. 7 ..	14	7	6	No	change
„ 8 ..	14	8	9	inc.	1/3
„ 11 ..	14	11	3	„	2/6
„ 12 ..	14	11	3	No	change
„ 13 ..	14	11	3	„	„

Zinc Sheets (English)

	£	s.	d.		
Feb. 7 ..	23	10	0	No	change
„ 8 ..	23	0	0	dec.	10/-
„ 11 ..	23	0	0	No	change
„ 12 ..	23	0	0	„	„
„ 13 ..	23	0	0	„	„

Lead (English)

	£	s.	d.		
Feb. 7 ..	12	5	0	No	change
„ 8 ..	12	5	0	„	„
„ 11 ..	12	10	0	inc.	5/-
„ 12 ..	12	10	0	No	change
„ 13 ..	12	10	0	„	„

AVERAGE MONTHLY PRICES OF STEEL SHIP ANGLES (NORTH OF ENGLAND).

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly average
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1900	7 15 0	8 0 0	8 2 6	8 5 0	8 5 0	8 7 6	8 7 6	8 2 6	8 2 6	8 0 0	7 10 0	7 10 0	8 0 7½
1901	6 15 0	6 12 6	6 5 0	6 0 0	6 0 0	5 10 0	5 15 0	5 17 6	6 0 0	5 17 6	5 17 6	5 15 0	6 0 5
1902	5 12 6	5 10 0	5 10 0	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 7 6	5 11 8
1903	5 6 3	5 6 3	5 7 6	5 12 6	5 12 6	5 10 0	5 10 0	5 10 0	5 10 0	5 10 0	5 10 0	5 0 0	5 8 9
1904	5 0 0	4 17 6	5 2 6	5 5 0	5 5 0	5 5 0	5 5 0	5 5 0	5 0 0	5 0 0	5 0 0	5 5 0	5 2 6
1905	5 5 0	5 7 6	5 10 0	5 10 0	5 10 0	5 10 0	5 10 0	5 10 0	5 12 6	6 2 6	6 12 6	6 12 6	5 14 4½
1906	6 12 6	6 12 6	6 12 6	6 12 6	6 12 6	6 12 6	6 12 6	6 12 6	6 12 6	6 12 6	6 12 6	7 2 6	6 13 4
1907	6 17 6	7 2 6	7 2 6	7 2 6	7 2 6	7 2 6	7 2 6	7 2 6	7 2 6	7 2 6	6 12 6	6 12 6	7 0 5
1908	6 2 6	6 2 6	6 2 6	5 17 6	5 17 6	5 17 6	5 17 6	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 16 3
1909	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 7 6	5 7 6	5 7 6	5 7 6	5 7 6	5 7 6	5 7 6	5 9 7
1910	5 16 3	5 17 6	5 17 6	6 1 6	6 2 6	6 2 6	6 2 6	6 2 6	6 2 6	6 2 6	6 7 6	6 7 6	6 2 3½
1911	6 7 6	6 7 6	6 7 6	6 7 6	6 7 6	6 7 6	6 7 6	6 7 6	6 7 6	6 7 6	6 7 6	6 9 0	6 7 8½
1912	6 16 3	6 17 6	6 17 6	7 5 0	7 7 6	7 7 6	7 7 6	7 12 6	7 12 6	7 12 6	7 14 6	7 17 6	7 7 4½
1913	7 17 6	7 17 6	7 17 6	7 17 6	7 17 6	7 17 6	7 17 6	7 11 6	7 7 6	6 15 0	6 7 6	6 2 6	7 8 11½
1914	6 2 6	6 2 6	6 2 6	6 2 6	6 2 6	5 15 0	5 15 0	6 15 0	7 0 0	7 0 0	7 1 3	7 5 0	6 8 7½
1915	7 17 0	8 5 0	8 17 6	9 5 0	9 5 0	9 15 0	9 15 0	9 15 0	9 15 0	9 15 0	10 15 0	10 15 0	9 8 3½
1916	11 3 1½	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6
1917	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6
1918	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6
1919	11 2 6	13 12 6	13 12 6	13 12 6	17 2 6	17 1 3	17 0 0	17 15 0	17 15 0	17 15 0	17 17 6	18 5 0	16 1 9
1920	19 10 0	20 0 0	21 10 0	22 0 0	23 5 0	24 0 0	24 0 0	24 0 0	24 15 0	24 10 0	24 0 0	24 0 0	22 19 2
1921	22 10 0	20 12 6	19 0 0	17 10 0	17 10 0	16 6 0	14 10 0	14 3 4	13 10 0	11 15 0	10 0 0	9 12 6	15 11 7
1922	9 17 6	10 0 0	10 0 0	10 0 0	10 0 0	9 17 6	9 10 0	8 15 7½	8 14 0	8 12 6	8 12 6	8 12 6	9 7 8½
1923	8 18 1½	9 1 3	9 14 0	10 0 0	10 0 0	10 0 0	9 8 9	9 9 6	9 10 0	9 8 9	9 11 6	9 18 9	9 11 8½
1924	10 0 0	9 18 1½	9 17 6	9 17 6	9 17 2	9 11 3	9 15 0	9 15 0	9 9 4½	9 6 6	9 5 0	9 5 0	9 13 1½
1925	9 2 0	9 0 11½	9 0 0	8 15 9	8 10 3½	8 9 0½	8 6 3	8 2 6	7 19 0½	7 12 3	7 5 0	7 2 6	8 5 5½
1926	7 2 6	7 2 6	7 2 6	7 3 4	7 2 6	7 3 9	7 7 6	7 8 5½	7 9 0	7 12 6	7 16 3	8 0 6	7 7 7½
1927	7 18 9	7 17 6	7 17 6	7 14 8½	7 13 9	7 12 6	7 12 6	7 12 6	7 12 6	7 12 6	7 12 6	7 12 6	7 14 1½
1928	7 12 6	7 14 9	7 17 6	7 17 6	7 17 6	7 17 6	7 17 6	7 17 6	7 17 6	7 17 6	7 17 6	7 17 6	7 16 10½
1929	7 17 6	7 17 6	7 17 6	7 17 6	8 0 6	8 2 6	8 2 6	8 2 6	8 2 6	8 2 6	8 2 6	8 5 0	8 0 10½
1930	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6
1931	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6
1932	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6
1933	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6
1934	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6	8 7 6
1935	8 7 6	—	—	—	—	—	—	—	—	—	—	—	—

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SITUATIONS VACANT AND WANTED

FOUNDRY Foreman requires position; practical man, sound experience general engineering, jobbing and machine-moulding; take entire charge of small foundry as Working Foreman; best results possible.—Box 138, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

PATTERN Equipment Designer or Pattern Lay-out Man desires position with British firm. Twelve years' foundry experience on all classes of automobile work. Familiar with the latest methods and equipment in both foundry and coreshop.—Box 150, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

FOUNDRY Foreman required for Birmingham district, to take charge of a foundry making chilled and miscellaneous castings; must be progressive and conversant with all modern methods. Give full particulars, age, experience and salary required.—Box 162, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

FOUNDRY Foreman wanted for a jobbing foundry in Nottingham. Good disciplinarian and metal mixer.—Full particulars, Box 154, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

WANTED, Foreman Coremaker; male and female labour; repetition work; malleable iron.—Apply, stating wages, to Box 156, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

WANTED, Foundry Foreman, experienced in the manufacture of heat-resisting and stainless castings. Practical training in moulding and foundry operations in alloy-steel castings essential.—State age and experience, and salary required, to Box 152, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

WANTED, Practical Foundry Works Chemist experienced in manufacturing core compounds, etc.; able when necessary to act as demonstrator and deal with technical questions arising.—Reply, Box 14977, c/o DAWSON'S, 129, Cannon Street, E.C.4.

EMPLOYMENT REGISTER.

Conducted by the Institute of British Foundrymen by courtesy of the proprietors of THE FOUNDRY TRADE JOURNAL.

Correspondence should be addressed to the General Secretary, Institute of British Foundrymen, St. John Street Chambers, Deansgate, Manchester, from whom full particulars can be obtained of this service.

Any employer wishing to communicate with a candidate should write to the General Secretary, quoting identification number.

FOUNDRY Manager requires position; has had considerable experience in complete control, locomotive, railway and general engineering work. Iron, steel, non-ferrous and patternshop. (254)

METAL Patternmaker desires position as Charge over metal patternshop or progressive position attached to foundry. Accustomed to ferrous and non-ferrous casting production, modern methods. Technically trained in foundry practice and science, metallurgy, foundry calculations and making of working drawings. Age 29. (255)

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FOUNDRY, situated in centre of London, together with goodwill, established 150 years, for Sale, Lease or Freehold.—Reply, Box 164, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

AGENCY

MALLEABLE Ironfoundry in the Midlands requires Agents in Middlesbrough, Manchester, Liverpool, Leeds, Lincoln, Birmingham, Bristol, London, Southampton and Cardiff to work on commission basis.—Box 158, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

PATENT

THE Proprietor of British Patent No. 362,715, dated May 17, 1930, relating to "Improvements in Making Semi-Finished or Finished Steel Products," is desirous of entering into arrangements by way of a licence or otherwise on reasonable terms for the purpose of exploiting the above Patent and ensuring its practical working in Great Britain.—Inquiries to B. SINGER, Steger Building, Chicago, Illinois.

MACHINERY

NEW Dwarf Cupola, to melt 10 to 15 cwts. per hr. New Worm-geared Ladles, 5 tons, 25 cwts., 15 cwts. and 10 cwts. capacity. Ungeared Ladles, 15 cwts. and 10 cwts. capacity. Improved Cupola Spark Arresters.—T. DAVIES & SON, West Gorton, Manchester.

SANDBLAST PLANTS

Room Plants, sizes 12 ft. x 12 ft., 12 ft. x 9 ft. and 6 ft. x 6 ft., made up in cast-iron sections.

Barrel Plants, 30 in. dia. x 36 in. long and 30 in. dia. x 18 in. long rotary barrels.

Cabinet Plants, in sizes 4 ft. x 4 ft. x 4 ft., 36-in. dia. and 30-in. dia. operators' cabinets.

Most of the above by Tilghman and complete with Air Compressors.

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By Adaptable, Pridmore, Darling & Sellars, etc.; Squeezers by Utard (unused), Samuelson and Britannia, also Farwell Universal Type.

Ladles, Grinding Machines, Exhaust Fans, Blowers, Air Compressors and 500 Electric Motors and Dynamos.

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5 LANCS BOILERS, 30' x 8', 100 lbs. w.p.

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Write for "Albion" Catalogue.

Grams: "Forward." 'Phone: 23001 (10 lines).
ALBION WORKS, SHEFFIELD

MISCELLANEOUS

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MISCELLANEOUS—*Continued*

PATTERNS IN WOOD AND METAL for all branches of Engineering. Moulding methods carefully considered.—FURMSTON & LAWLOR, Letchworth.

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24 Cans ea. 14 in. x 17 in.
24 Cans ea. 14 in. x 18 in.
Weight 5 tons 8 cwts.
25 Stools. Weight 1 ton 3 cwts.
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PATTERNS.—Inquiries solicited; quotations by return; shop equipped with modern machinery; quick delivery.—CLEGHORN & COMPANY, Midland Pattern Works, Spring Gardens, Worcester. 'Phone 264.

CEYLON PLUMBAGO (in casks), Empire produce—direct import, always in stock.—Quotation and samples from WILLIAM OLSEN, LIMITED, Hull.

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'Phone: 287 SLOUGH
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18"×36" TABOR rollover shockless (portable).
40"×30" TABOR rollover shockless.
TWO BRITANNIA No. 1 jolters.
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EXTENDED PAYMENTS ARRANGED.

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12' × 9' Tilghman sandblast room, built of cast iron plates, complete with 400 cu. ft. Tilghman air compressor and all accessories.
T.B. 4 Tilghman sandblast barrel plant, complete. Size of barrel 60" × 40".
T.B. 1 Tilghman sandblast barrel.
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